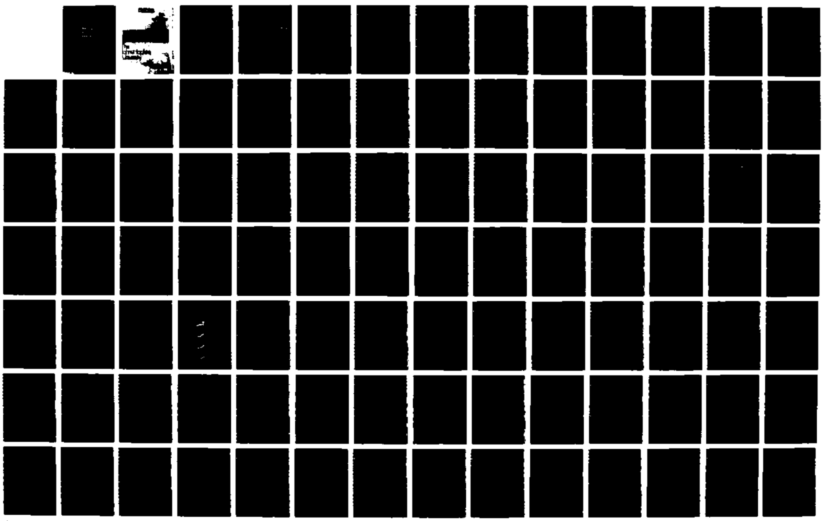
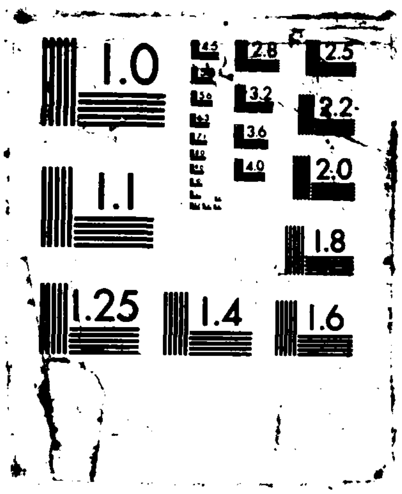
AD-A193 373 ENHANCING PRODUCTIVITY IN NAVAL AVIATION TRAINING IN A MARKET OF CHANGING..(U) JOHNS HOPKINS UNIV BALTIMORE MD CENTER FOR SOCIAL ORGANIZATIO.. J H BRADDOCK ET AL. 01 MAR 88 TR-ONR-1 N00014-85-K-0780 1/4

UNCLASSIFIED F/G 5/9 NL

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REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION

1b. RESTRICTIVE MARKINGS

2a. SECURITY CLASSIFICATION AUTHORITY

3. DISTRIBUTION / AVAILABILITY OF REPORT
Unlimited

2b. DECLASSIFICATION / DOWNGRADING SCHEDULE

4. PERFORMING ORGANIZATION REPORT NUMBER(S)
TR-ONR-1

5. MONITORING ORGANIZATION REPORT NUMBER(S)

6a. NAME OF PERFORMING ORGANIZATION
Ctr for Social Organization of Schools-The Johns Hopkins Univ.

6b. OFFICE SYMBOL *(If applicable)*

7a. NAME OF MONITORING ORGANIZATION
Office of Naval Research

6c. ADDRESS *(City, State, and ZIP Code)*
3505 North Charles Street
Baltimore, MD 21218

7b. ADDRESS *(City, State, and ZIP Code)*
800 North Quincy Street
Arlington, VA 22217-5000

8a. NAME OF FUNDING / SPONSORING ORGANIZATION
See Block 16

8b. OFFICE SYMBOL *(If applicable)*
Op-01B7

9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
N00014-85-K-0780

8c. ADDRESS *(City, State, and ZIP Code)*
DCNO (MPT), Op-01B7
Dept. of the Navy, Washington, DC 23050-2000

10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.
63707/63720	R1772	RF63-521-803	NR475-043

11. TITLE *(Include Security Classification)*
Enhancing Productivity in Naval Aviation Training in a Market of Changing Demographies

12. PERSONAL AUTHOR(S)
Braddock, Jomills H., Crain, Robert L., Taylor, Marylee C., and Wu, Shi-Chang

13a. TYPE OF REPORT
Final

13b. TIME COVERED
FROM 9/1/85 TO 12/31/86

14. DATE OF REPORT *(Year, Month, Day)*
88-03-01

15. PAGE COUNT
305

16. SUPPLEMENTARY NOTATION
Funded by Office of the Deputy Chief of Naval Operations for Manpower, Personnel & Training

17. COSATI CODES

FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS *(Continue on reverse if necessary and identify by block number)*

19. ABSTRACT *(Continue on reverse if necessary and identify by block number)*

This study analyzes CNATRA Automated Training Jackets, a new survey of NASC accessions, and extensive structured interview data to:

1) describe the complex flow of Student Naval Aviators (SNAs) through the various paths of the aviation training pipeline in terms of attrition/completion patterns and training time;
2) examine the extent to which technical major and AQT/FAR scores predict training success for Student Naval Flight Officers (SNFOs) and Student Naval Pilots (SNPs), respectively;
3) analyze differences in the training outcomes for minority and nonminority candidates;
4) develop a new survey instrument for Naval Aviation Schools Command (NASC) that provides detailed biographical information on naval aviation accessions;
5) establish an automated data base that collates information from the accession survey with performance data, for the purpose of monitoring trends and identifying background and experiential indicators for the "whole-man" concept in naval aviation recruitment and selection;

(over)

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS

21. ABSTRACT SECURITY CLASSIFICATION

22a. NAME OF RESPONSIBLE INDIVIDUAL
CDR T. N. Jones

22b. TELEPHONE *(Include Area Code)*
202-696-4713

22c. OFFICE SYMBOL
OCNR 125

Block 19 (continued)

6) recommend enhancements in recruitment, selection, and the training process which can reduce failures and increase efficiency while maintaining the high quality that is the hallmark of naval aviation;
7) outline promising strategies for further research, including potential experiments as well as analyses of automated data bases.

Enhancing Productivity In Naval Aviation Training

In A Market of Changing Demographics

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March 1988

FINAL REPORT

Approved for Public Release

Prepared for Office of Naval Research, 800 North Quincy Street, Arlington, Virginia 22217

This report was supported by a research grant from the Office of the Deputy Chief of Naval Operations for Manpower, Personnel and Training (N00014-85-K-0780).

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EXECUTIVE SUMMARY

Enhancing Productivity In Naval Aviation Training In A Market of Changing Demographics

Escalating training costs, increased competition for trained aviators from civilian airlines, a shrinking recruitment pool that contains larger proportions of racial/ethnic minorities -- these are realities for naval aviation in the 1980s and beyond. The research described here was developed to assist in meeting the challenge these realities present. The goal is an enhanced program of recruitment, selection, and training of minority and nonminority candidates, so that high quality naval aviators can be produced with optimal efficiency.

This project had seven specific objectives:

1) describe the complex flow of Student Naval Aviators (SNAs) through the various paths of the aviation training pipeline in terms of attrition/completion patterns and training time;
2) examine the extent to which technical major and AQT/FAR scores predict training success for Student Naval Flight Officers (SNFOs) and Student Naval Pilots (SNPs), respectively;
3) analyze differences in the training outcomes for minority and nonminority candidates;
4) develop a new survey instrument for Naval Aviation Schools Command (NASC) that provides detailed biographical information on naval aviation accessions;
5) establish an automated data base that collates information from the accession survey with performance data, for the purpose of monitoring trends and identifying background and experiential indicators for the "whole-man" concept in naval aviation recruitment and selection;

6) recommend enhancements in recruitment, selection, and the training process which can reduce failures and increase efficiency while maintaining the high quality that is the hallmark of naval aviation;

7) outline promising strategies for further research, including potential experiments as well as analyses of automated data bases.

To accomplish these objectives, we analyzed several diverse and broad-based sources of data including: three different files of CNATRA's Automated Training Jackets (ATJs); an enhanced data file built at Johns Hopkins University containing a detailed record of SNA flight failures and review boards, as well as the data routinely entered on computerized CNATRA-ATJ files; responses from 998 recent Aviation Officer Candidate School (AOCS) and Aviation Pre-Flight Indoctrination (APFI) accessions to the Student Information Survey developed for this project by our research team at Johns Hopkins University; records from more than two hundred interviews with training and operational naval aviation personnel.

To address the first objective, we present statistical "flowline analyses" of the progression of Student Naval Aviators through the aviation training pipeline. The findings, reported in Chapter Three, highlight major differences in the Pre-entrance and NASC attrition rates for AOCS and APFI accessions, and in the Flight Training attrition rates for SNPs and SNFOs. In the early stages of training, APFI attrition is approximately 4%, while AOCS attrition is around 33%. In flight training, SNP attrition is approximately 20%, while SNFO attrition is about 36%. Taken together, these differences imply that: the completion rate for SNPs who entered via APFI is 78%; for SNPs who entered via AOCS the completion rate is 53%; for SNFOs who entered via APFI, the completion rate is 60%; and for SNFOs who entered via AOCS the completion rate is 44%.

The results of "risk factor analyses" examining the impact of undergraduate major field and AQT/FAR scores on SNA performance, reported in Chapter Four, suggest that SNFO and SNP training seem to require somewhat different sets of skills.

The Student Naval Aviator with a technical college major has a definite advantage as an SNFO, and the possibility is worth considering that students with technical majors should be given priority in selection for flight officer training. However, there is no evidence here that an undergraduate technical major is of great help in identifying successful SNPs. It is true that students with technical backgrounds have less trouble in AOCS/APFI classroom work and learn to fly primary trainers more easily; but after that point, the SNP with a background in a nontechnical field is barely distinguishable from one with a technical undergraduate major.

With respect to the predictive value of the AQT and FAR, we conclude:

*** SNFOs with low AQT and FAR scores have records of lower performance at all stages of the program and are less likely to complete training. However, even here, three-quarters of the SNFOs with AQT or FAR scores below 5 who enter flight training will complete it.

*** SNPs who score low on the AQT or the FAR perform less well in NASC; they have lower academic scores in primary training, and they have moderately lower academic performance scores in advanced training. However, SNPs with low AQT or FAR scores earn only slightly lower scores in flight training. In general, the AQT and FAR must be considered weak predictors of SNP training success.

*** SNPs with scores below 6 on the AQT and FAR do not stand an increased risk of attrition during flight training.

Navy policy makers may have difficulty drawing strong conclusions from this set of data. There is neither overwhelming evidence that the AQT/FAR is of great value nor strong evidence that it is worthless. Some conclusions can be drawn, however. The first is that the Navy seems justified in its present policy of lowering the requirements on the AQT/FAR when a shortage of pilot candidates appears in the recruitment pool. However, the Navy should be reluctant to encourage students with low scores to enter the SNFO pipeline. Second, recent consideration

has been given to using a psychomotor, non-pencil-and-paper test to supplement the AQT/FAR. Given the importance placed upon mechanical skills, eye-hand coordination, and quick reflexes in pilot training, and given our findings that the AQT and FAR are not good predictors of flight performance, a non-pencil-and-paper test -- perhaps using a computer terminal or some other mechanical equipment -- seems appropriate. Third, we do not know enough about whether students can be coached on the FAR battery, and we do not know very much about the impact of multiple retakes of the test on performance. These issues should be studied in the future. Fourth, we have been told that review boards often take into account students' AQT/FAR scores. This practice is clearly problematic. Since these scores are not correlated so highly with flight performance, particularly for SNPs, they cannot provide useful information to a review board.

Because our research team was not granted access to the test items, we could not do a detailed analysis of the contents of the AQT and FAR, nor have we considered the value of different subcomponents or particular items on the battery. We have been informed that some items on the test ask for specific information which is outdated. It seems reasonable for the Navy to make at least a modest investment in improving the test, and it may well be that a large scale improvement effort is justified; however, we do think there are limits to the ability of any pencil-and-paper test to predict performance in the cockpit.

It is important to bear in mind that flight officer or pilot duties constitute only a portion of the demands placed on naval aviation officers. Those who have earned their wings must also perform the leadership and decision-making functions required of all Navy officers. We have not analyzed the degree to which a technical college major or high AQT or FAR scores may predict the non-flying performance of Navy officers. A senior officer with an undergraduate physics major or a high AQT score may better understand policy issues having to do with some highly technical aspects of the operation of the Navy, even if these factors do not pay off in aviation training. We urge that future research on technical college major and the AQT/FAR

take as criteria not only performance during aviation training but also downstream performance as an officer, particularly in decision making and supervision.

Chapter Four addresses another longtime concern of Navy decision-makers: the high attrition rates of Black and Hispanic students in aviation training. The consequences of this problem will become more severe, given projected demographic changes in the traditional talent pool from which naval aviators are recruited. To examine minority attrition and its causes, we conducted detailed analyses of the available data. The findings reveal that:

*** Minority candidates have lower flight and academic scores, but they have a much higher probability of being attrited from naval aviation training than one would predict from examining their flight or academic scores. This is especially true for SNFOs.

*** The poor performance of minority Student Naval Aviators cannot be explained by their lower AQT/FAR scores nor by major field in college -- minorities are as likely as nonminorities to have a technical college major.

*** Flight instructor judgments reflected in downs and review boards appear highly subjective: a different officer in a different training squadron looking at the same student would be very likely to make a different decision. This conclusion is based on our discovery that the number of downs earned in one training stage and the number of review boards held in that stage are very poor predictors of whether the student will receive a down again or see a second review board when they enter the next stage of training, even though the flight and academic scores the student earned in the earlier stage are reasonably good predictors of the scores they will receive in the next stage.

*** Among Student Naval Aviators with low flight grades, nonminorities were much less likely to be attrited than were minorities.

In light of these facts, we conclude that minority Student Naval Aviators are disadvantaged by the subjective elements of the decisions to award downs and hold boards and by extension the subjectivity of review board decisions. This explains why their performance is better when measured by flight scores and why their higher attrition cannot be explained by such background factors as AQT or FAR scores. Our analysis suggests that making attrition decisions purely on the basis of flight and academic performance scores would reduce minority attrition, perhaps by as much as one-third. However, even this might not eliminate all undesirable subjectivity, because there is still ample room for subjectivity and bias in making decisions about what flight score a student has earned.

One important objective of this project was to develop and test the NASC Student Information Survey. This in-depth questionnaire was designed for administration to all aviation training accessions at Naval Aviation Schools Command. Merged with NASC grade records, the computerized Student Information Survey/Grade Card file provides: (1) a source of extensive baseline data for monitoring the profile of accessions in naval aviation training over time; and (2) a means for comprehensive assessments of determinants of success in the early stages of aviation training. But this is only part of the potential usefulness of this file: Merged with computerized CNATRA-ATJ data, it can provide much more comprehensive information than has existed to date about which factors predict success and failure downstream in the naval aviation training pipeline. Such information would provide Navy decision makers not only with the basis for refining selection procedures. It would also allow them to identify potential points of intervention, in order to minimize attrition and enhance the productivity of training without lowering standards or sacrificing quality of output.

Based on data collected with the NASC Student Information Survey instrument during May 1986 through September 1986, Chapter Five presents a broad-based profile of recent accessions in naval aviation training. Among many interesting patterns, these data reveal that:

*** Nearly half (forty-nine percent) of recent NASC accessions enter naval aviation training with an undergraduate major in a technical field. Moreover, eighty-three percent had completed three or more undergraduate courses in mathematics, and seventy-two percent had completed three or more undergraduate physical science courses. Significantly, minorities (Blacks, in particular) were found to be even more likely than nonminorities to have entered naval aviation training with an undergraduate major in a technical field.

*** Approximately two of five recent NASC accessions (thirty-nine percent) entered naval aviation training having had previous flying experience. Roughly one-quarter of this group had earned a private pilots license prior to entering naval aviation training. Minority vs. nonminority Student Naval Aviator differences in pre-flight experience were not significant.

*** Recent NASC accessions are quite well-rounded individuals. The median rate of *undergraduate extracurricular involvement* among Student Naval Aviators is three different activities (intramural sports, intercollegiate sports, professional or service organizations are typical activities), and the median rate of participation in routine fitness/leisure activities among Student Naval Aviators is six different activities (running, swimming, weightlifting, tennis/racquetball are typical). In addition, as undergraduates this group of accessions exhibited good academic work habits (devoting a median eighteen hours/week to study and homework), and earned grades averaging 2.80 on a 4-point scale, in difficult, technically-oriented, coursework.

Significant subgroup differences notwithstanding, the Student Naval Aviator accession profiles during the period of this study show that naval aviation training is attracting well-qualified and highly motivated AOCS and APFI accessions representing minority and nonminority populations. Nevertheless, it is important to point out that racial and ethnic minorities (especially Blacks) remain underrepresented among recent naval aviation accessions.

Despite some movement toward parity in accession rates among Hispanics, our NASC Student Information Survey data shows that the accession rate for Blacks in naval aviation training (1.8%) falls considerably below the Black male share of baccalaureate degrees conferred (5.4%), and well below the pool of Black males earning baccalaureate degrees in technical fields (3.5%).

The broad-based and diverse data collected and analyzed for this project have yielded a rich set of recommendations for enhancing the productivity of naval aviation recuitment, selection, and training. Presented in Chapter Six, these recommendations vary in complexity, scope, and ease of implementation. Some are targeted to address specific problems faced disproportionately by minorities. All, in our judgment, carry the potential for increasing the probability that top quality candidates will earn the wings of a naval aviator. A sample of these recommendations is presented below:

Recruiting

*** The SEMINAR program should be expanded. All minority aviators enroute to the FRS should be invited and encouraged to spend a limited period of time at their hometown or college location, assisting in the recruitment effort. In addition, Navy Recruiting Command should explore other means of using minority aviators to assist in recruiting on an adjunct basis.

*** Navy Recruiting Command should adjust the system of professional incentives so that recruiters can receive maximum competition points only if they meet their goals for minority accessions.

*** Recruiters should receive credit only for those accessions who successfully complete AOCS. NASC should provide feedback that permits CNRC to give each Recruiting District detailed information about the reasons for attrition among AOCS students recruited from that district.

Selection

- *** CNATRA should undertake a long-term evaluation of accessions admitted to naval aviation training with a 20/20 vision waiver (AVW) and those admitted via the NAVCAD, AVROC and Aviation Duty Officer (ADO) programs. This evaluation should include a comparative analysis of training program completion rates, fleet performance, promotion, and professional development.
- *** Information about civilian flight experience gathered on the newly constructed NASC Student Information Survey should be used to assess the short- and long-term benefits of prior flight experience to naval aviators. Results should be used to guide Navy Recruiting Command on the importance of previous flight experience in the screening process.
- *** To assess the predictive validity of naval aviation selection tests, Recruiting Command and CNATRA should, for a limited period of time, waive the AQT/FAR for an experimental cohort of potential accessions who have an undergraduate grade point average above 2.80 (the mean for current NASC accessions), or who have a technical major and a grade point average above 2.5. Students in this experimental group should be scheduled to arrive at NASC one day early, on which they would be administered the AQT/FAR, practice sessions for the Graduate Record Examinations (GRE), and a series of other potentially predictive instruments. AQT/FAR scores for students who enter during this limited experimental period would be sequestered and would be available only to specifically designated personnel for research purposes. The predictive validity of the AQT/FAR would be assessed by comparing accessions earning low and high AQT/FAR scores in terms of their training completion rates, and ultimately in terms of the quality of their subsequent fleet performance and Navy retention.

Pre-Preparation for Naval Aviation Schools Command

*** All students participating in NROTC summer programs should receive broadened exposure to the aviation community. In addition, students should be invited to participate in introductory ground school training during the summer program and should be offered the opportunity for ten - fifteen hours of in-flight training.

*** A Pre-Reporting Guide should be designed for distribution to all AOCS candidates as soon as they are notified of their acceptance for naval aviation training. The guide should include: 1) A description of AOCS structure, mission, and goals, an outline of the courses and curriculum, and hints on how to best to prepare for AOCS; 2) An outline of essentials of Navy organization, symbols, protocols, and so on (for example, insignia, ranks); 3) A self-diagnostic test of technical concepts and methods (with references for pre-AOCS individual study); and, 4) Physical fitness guidelines, listing the AOCS physical training requirements and identifying appropriate exercise regimens for candidates to pursue independently as preparation for AOCS.

*** NAVIP should be offered to all candidates, minorities and nonminorities alike.

*** A thorough evaluation should be conducted of the effectiveness of AOCS Prep in improving the aviation training performance of participants.

*** Navy Recruiting Command should insure that recruiters in the field 1) actively seek to access the swimming skills of potential accessions to naval aviation, and 2) refer nonminorities as well as minorities needing swim pretraining to the TADPOLE SWIM program at Pensacola.

*** NROTC students should be retested in swimming as they approach graduation, and the test should more closely parallel the swim requirements for flight training.

Aviation Officer Candidate School

- *** Professional editors should review textbooks for AOCS/APFI courses as these texts are drafted and revised.
- *** For each AOCS class a "class score" should be computed and serve as one of the bases for evaluation of Class Officers. The score should also be cumulated across classes, so that a semi-annual average of class scores can become one of the performance measures of Naval Aviation Schools Command as a whole. The class score is an easily maintained numerical computation that provides a comparable quantification of class performance and encourages optimum performance and retention without incurring penalties for the loss of students who could not and should not have been retained.
- *** CNATRA should conduct an evaluation of the relative effectiveness of a modified AOCS training design. Nine consecutive classes would participate in an experiment, five receiving a modified AOCS program and four receiving the existing AOCS program. Candidates would be assigned to the respective classes at random, and the relative effectiveness of the programs would be assessed by comparing the two groups of students in terms of their training completion rates, quality of subsequent fleet performance, and Navy retention. The experimental program would be characterized by several features. First, each of the goals would be addressed by a state-of-the-art training component. Second, leadership training would receive relatively greater emphasis, parallel to its role in the USNA program. Third, sequencing of AOCS training components would be carefully planned so that optimal performance would be encouraged in each aspect of the program and the various programs are mutually reinforcing. A detailed curriculum for the AOCS Experimental Class would be professionally designed in accordance with a set of specific guidelines and criteria.

Navy Postgraduate School staff, the Navy's professional educators, would probably be best equipped to perform this task. After approval of the proposed curriculum by CNATRA, the program would be implemented by NASC, using carefully selected volunteer instructors from the instructional staff.

Flight training

*** Learning Centers at training sites should be equipped with curricular materials specifically constructed to allow "pooled" students to study ahead on ground school materials.

*** The current contract for operation of the simulator stations at training sites should be amended so that simulator stations are open after scheduled hours for voluntary student practice.

*** The mentoring system for SNFOs employed in VT86 should be used as a model for a mentoring system in VT10.

*** Students should begin each phase of training with a clean slate. Downs should accumulate only within phases of training and boards should be determined by the number of downs within a phase.

*** CNP and CNMPC should enhance the attractiveness of flight instructor assignments. For example, Training Command instructor assignments could be accompanied by a guarantee for a subsequent fleet seat, and the instructorship assignment could be incorporated in the Precept to the Promotion Board from SECNAV.

*** CNMPC should insure that aviation detailers are provided specific criteria to be used in the selection of officers to be assigned as NASC/CNATRA instructors. These criteria should include 1) a personal interview and 2) a recommendation from the prospective instructor's present C.O., evaluating the officer's suitability for this important assignment.

Finally, Chapter Six outlines a number of promising strategies for future research including potential experiments, ongoing surveys, and analysis of enhanced computerized data bases. Specific recommendations include the following:

*** An "Exit Questionnaire" should be designed and administered to all Student Naval Aviators on departure from aviation training, both graduates and attrites. The questionnaire should assess the student's experience in naval aviation training. For attrites, voluntary or involuntary, the questionnaire should gather detailed information about reasons for attrition.

*** A "Transition Questionnaire" should be designed and administered to all Student Naval Aviators as they move from each phase of training to the next. The questionnaire should focus on the student's experience with the particulars of the training phase being completed. The Transition Questionnaire should ask students to comment on specific courses, familiarization flights, check hops, and so on.

*** Two ongoing experients and training protocols should be instituted and integrated into the indoctrination of flight instructors and those who serve on student review boards, respectively. Each should be true experimental designs of the type that social psychologists have used effectively to examine subtle bias. Briefly, flight instructors and review board members would be presented with detailed performance information about a hypothetical naval aviation student and asked to record a judgment about the candidate. The performance information presented to these evaluators would be standard, but the hypothetical candidate would be presented differently to different evaluators -- sometimes as Black or Hispanic, sometimes white. Comparisons could then be made of the judgments of evaluators who were presented with identical performance information but with contrasting descriptions of the students purported to be responsible for that performance. These comparisons would serve both as experimental data and for instructor training, sensitizing them to the dangers of unintentional bias.

*** CNATRA should establish ongoing data collection mechanisms so that a computerized data base is established containing the following information for each student: a) background data and aviation training performance records, as represented on the Automated Training Jackets; b) detailed background and attitudinal information being collected with the newly-constructed NASC Student Information Survey; c) information from the proposed Exit Questionnaire and the Transition Questionnaires.

CHAPTER ONE

Introduction

The broad aim of this research was to assist the Navy in determining how it can, in a reasonable and cost-effective way, increase the number of candidates completing Naval aviation training while maintaining highest standards in quality of output.

1.1 BACKGROUND

The Navy's effort to staff its six-hundred ship fleet faces several potential sources of aviation personnel shortfalls. These include attrition from naval aviation training, attrition among experienced naval aviators, increased competition from the civilian airlines, and a declining and demographically changing pool of college-trained males with high-tech specialties. These factors, singly and in combination, have important potential consequences for maintaining the traditionally high quality of naval aviation personnel and for meeting naval aviation endstrength requirements.

The impact of such factors can be particularly acute in an era of fleet expansion. The Department of Defense's current and projected goals for expansion of Naval forces will require an increase in aviation personnel as well as in other communities (Defense Manpower Data Center, 1986). The growing personnel needs in naval aviation are compounded by recent advances in military technology. In many areas, the Navy has been at the forefront of the U. S. Armed Forces in unprecedented modernization and the introduction of sophisticated new weapons systems. This modernization has brought about a shift in skill requirements such that the Navy's "semi-technical" positions were estimated to increase by thirteen percent between 1981-86, "technical" positions by sixteen percent, and "highly technical" jobs by thirty-one percent (Daugherty, 1985). These trends are likely to continue into the foreseeable future.

The Navy's ability to meet the future aviation personnel needs of an expanded and more technologically skilled force will be challenged by a demographically changing recruitment pool: a significant decline in the total population of 20- to 24-year-old males, and a larger proportion of Blacks and Hispanics among this shrinking manpower pool (Hodgkinson, 1985). These trends, based on divergent birth rates and average ages among different population subgroups, imply that the Navy as well as other branches of the U.S. Armed Forces, like public school systems and much of higher education, will comprise increasingly larger concentrations of minorities. The changing demographics have uncertain implications for naval aviation recruitment. On the one hand, the proportion of minority high school graduates attending college is declining (Hodgkinson, 1985) and minorities are underrepresented among college graduates with technical majors (Dorn and Butler, 1983; Thomas, 1986). On the other hand, some experts suggest that increasing numbers of talented minority youth will choose the military as their educational route, for its economy and the direct access it provides to "high technology" training and careers (Hodgkinson, 1985).

These demographic challenges to the attainment of naval aviation manpower goals must be met in direct competition with a changing civilian economy which also requires increasingly higher levels of technological training. The Navy will have to compete with the civilian sector to attract young and talented college trained males with technical majors into naval aviation training; and the Navy could have to compete with commercial airlines and high-tech corporations to retain experienced naval aviators.

1.2 PREVIOUS RESEARCH ON NAVAL AVIATION TRAINING SUCCESS

Recognizing that *first rate naval aviators are made, not born*, Navy officials have traditionally sought ways to effectively meet the personnel requirements of naval aviation through recruitment *and* training. As with any large scale organization requiring highly refined and

specialized technical skills, there must be an appropriate balance between *selecting* candidates with the appropriate aptitudes and other traits essential to success and developing and maintaining a *training* pedagogy and environment that are optimally conducive to full utilization and development of the human talents in the available pool.

Despite the need for such balance, research has focused primarily on the development of selection tests designed to predict success in naval aviation training (see North & Griffin, 1977, for a comprehensive review of research on aviation selection test development; and see Griffin & Mosko, 1977, for a comprehensive review of aviation attrition studies). Two broad types of selection tests<*> have received attention: (1) cognitive/perceptual paper-and-pencil tests; and, (2) psychomotor tests.

"Cognitive/perceptual" paper-and-pencil testing for aviation selection has a long and well-established history and is probably the most frequently used method for screening candidates for admission to naval aviation training. Nevertheless, based on their review of aviation selection research, North and Griffin (1977) caution that the limited predictive power of paper-and-pencil tests, and the lack of any prominent research breakthrough in this area, suggest that more research on non-paper-and-pencil performance testing is needed.

"Psychomotor" research also has a longstanding, but sporadic, legacy in aviation selection and performance studies. Psychomotor testing has not been widely used in naval aviation selection due to its high cost and difficulties of test implementation. However, recent technological advances and the potential usefulness of psychomotor tests, combined with the need to supplement paper-and-pencil test selection to improve the predictive power of aviation selection criteria, have led to a resurgence of interest in psychomotor testing and ongoing research to validate selection devices in both the Navy and the Air Force (Do[illegible]ler, 1986).

<*> A third type, physiological testing, received some early attention but was determined to have little or no utility as a predictor of flight training success (Viteles, 1945, cited in North & Griffin, 1977).

As North and Griffin (1977) point out, the perceptual/cognitive paper and pencil and psychomotor tests developed as an outgrowth of previous research reduced pre-World War II attrition rates in aviation training by nearly 50%. Nevertheless, many naval aviation officials regard current levels of attrition rates as unacceptably high. The persistent low completion rate, coupled with the escalating cost of flight training, points to the need for further research on selection tests, but also to the need for broader approaches to analyzing success in naval aviation training.

"Risk-factor" studies represent one such approach. Naval and Air Force aviation recruiters and selection researchers generally recognize the importance of individual background, skills, and aptitudes (e.g., test scores, socioeconomic status, education, college grades, major field) as well as experiential and social psychological factors (e.g., pre-flight experience, attitudes, interests) as key correlates of success or failure in aviation training. However, because this area has received less systematic research attention, we are far short of any thorough understanding about which specific dimensions, among the diverse array of potential risk factors, may have the greatest influence on success or failure in aviation training.<*> One recent investigation of correlates of success in naval aviation training among minority aviators (Petho, 1985) has demonstrated that discrete risk-factor information can supplement traditional paper-and-pencil test data to enhance the Navy's ability to identify high-risk candidates.

The present study extends and broadens previous research on success in naval aviation training in a number of respects: Extensive analyses are used to examine the predictive value of the AQT/FAR and of a non-test "risk factor," technical major. This investigation does not simply assess overall relationships: it asks how the interaction between individual traits and

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<*> Much also needs to be learned about how to make the best use of specific risk-factor information in the selection process. For example, is it more useful to consider specific indicators of prior academic performance (e.g., college grades or class rank) separately to assess their unique contribution to the predictive power of a selection model, or are such indicators most useful when factored into some larger linear composite subscale profile like the Biographical Inventory (BI) component of the Flight Aptitude Rating (FAR)?

aspects of the training environment affects the success of different subgroups of Student Naval Aviators (SNAs) -- Student Naval Pilots (SNPs) and Student Naval Flight Officers (SNFOs) in the several pipelines. Beyond this, in developing a crucial new source of data, a survey instrument for collecting broad-based information from recent accessions, the present project greatly expands the capacity for future research that aims to identify individual biographical factors predictive of success in aviation training.<*> Another major contribution of the present research, however, is our detailed consideration of the *training process* itself. On the one hand, we attempt to understand the record of minority performance in aviation training. On the other hand, we consider a wide range of training innovations that have the potential to enhance training productivity for minority and nonminority candidates alike.

1.3 OBJECTIVES OF THE PRESENT RESEARCH

This research applied quantitative analyses and qualitive insights in order to identify strategies for increasing the Navy's capability to meet its future aviation personnel needs through enhanced training productivity. The research took a systemic approach, in recognition that recruitment, selection, and the training process are inextricably-linked determinants of naval aviation training outcomes. Specific objectives of the project were to: 1) describe the complex flow of SNAs through the various paths of the aviation training pipeline in terms of attrition/ completion patterns and training time; 2) examine the extent to which technical major and AQT/FAR scores predict training success for SNFOs and SNPs, respectively; 3) analyze differences in the training outcomes for minority and nonminority candidates; 4) develop a new survey instrument that provides detailed biographical information on naval aviation accessions; 5) establish an automated data base that collates information from the accession survey with performance data, for the purpose of monitoring trends and identifying background and exper-

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<*> The enhanced data system can also be useful in predicting success in naval aviation operational environments, should reliable "downstream" criterion measures be developed.

iential indicators for the "whole-man" concept in naval aviation recruitment and selection; 6) recommend enhancements in recruitment, selection, and in the training process which can reduce failures and increase efficiency while maintaining the high quality that is the hallmark of naval aviation; 7) outline promising strategies for further research, including potential experiments, ongoing surveys, and analyses of automated data bases.

1.4 ORGANIZATION OF THE REPORT

The remaining text of this report is organized into a methodology chapter (Chapter Two) and five substantive chapters. The report also contains a supplementary appendix containing extensive data tables and data collection instruments, organized according to subject areas within chapters. This format allows the interested reader to go back and forth easily from the text to the appendices for more detailed information on a specific topic.

Chapter Two describes the data sources, data collection procedures, and analytic approaches of the report.

Chapter Three presents a descriptive flowline analysis of the progress of Student Naval Aviators from the beginning of Naval Aviation Schools Command (NASC) through the various training pipelines. These analyses, based on large samples of the best Chief of Naval Aviation Training (CNATRA) Automated Training Jacket (ATJ) data available, estimate attrition rates for each procurement source, aviation community and pipeline, and for the various stages of aviation training. Average training times are also reported.

Chapter Four uses available CNATRA ATJ data from two large samples of SNAs to examine the relevance in naval aviation training of three key factors -- undergraduate major field, AQT/FAR scores, and race/ethnic background. The assessment of undergraduate major and AQT/FAR scores as predictors of training performance is designed to inform decisions about the use of these factors as selection criteria. The analysis of the implications of minority status in

the aviation training program responds to the Navy's determination to make the fullest use of the minority and nonminority talent in the recruitment pool. In these analyses, academic and flight performance scores at various stages of training are considered, along with the student's record of flight failures ("downs"), review boards, and attrition/completion.

Chapter Five, uses data on roughly one thousand recent NASC accessions, collected with a survey instrument developed as an important dimension of this project, to present a comprehensive description of Student Naval Aviators' demographic, educational, and military background. SNA accession profiles are compared for candidates representing different race/ethnic groups and procurement sources.

Chapter Six presents a compendium of broad-based recommendations for enhancing the productivity of naval aviation training. These recommendations, based on empirical analyses, official Navy records and surveys, extensive in-depth interviews of naval aviation personnel, and observations made during the course of this study, have *implications for recruitment, selection* and training policies as well as for future research.

Chapter Seven presents a synthesis of research findings and recommendations that have special relevance to minorities in naval aviation training.

CHAPTER TWO

Research Methodology

2.1 INTRODUCTION

This chapter describes the diverse data sources which are analyzed in this report and discusses general analytic procedures, methodological issues, and research limitations.

Adequate data is essential in order to identify determinants of SNA success and develop potential strategies for enhancing aviation training productivity.

At the outset of this project, it became clear that no ideal data set existed, and that the usefulness of any single source of existing naval aviation operations data would be constrained by many factors, including (a) decentralized record-keeping procedures among the many and diverse command units involved in aviation recruitment, selection, and training; (b) limited student background and training performance data included in CNATRA's Automated Training Jackets (ATJs); and, (c) extensive missing or inadequate data on selection tests and training performance criteria reported in the ATJs.

Thus, this project made use of CNATRA's best available data and then, where necessary, generated new, supplementary data.

2.2 DATA

As detailed below, three data tapes supplied by CNATRA were used for this project, together with: an enhanced computerized data file constructed by our research team; a new, computerized bank of biographical data on accessions; and records from structured interviews at training sites.

2.2.1 *CNATRA Automated Training Jackets*

As part of its ongoing operations, CNATRA maintains computerized records to track trainee progression through the system and to assess manpower production in naval aviation training. These computerized data files or Automated Training Jackets (ATJs) contain student background information (sex, race-ethnicity, hometown, date of birth, rank, procurement source, college name, degree earned, major field, and AQT/FAR scores), along with summary academic and flight performance scores (raw and standardized) for each stage of aviation training. The ATJ records cover naval aviation training accessions from Naval Aviation Schools Command (NASC) through completion of undergraduate aviation training, or until attrition. Each student record also contains beginning and ending dates for each phase of naval aviation training.

Because this computerized automated tracking system is relatively new and is still being updated and modified, several different sources of CNATRA ATJ data were used for this project:

(1) CNATRA-ATJ Tape I: This computerized ATJ data tape was one of the early data files made available to our research team by CNATRA. It contains the records of 7805 accessions who reported to the Naval Aviation Schools Command (NASC) roughly between January 1, 1983 and March 11, 1986. This file suffers from extensive missing data pertaining to the later stages of training, particularly from missing flight training performance measures. On the other hand, among the four computerized data files available to us, CNATRA-ATJ Tape I contains the most complete record of student outcomes during the early training stages, from the preoutpost or "Poopey Week" of Aviation Officer Candidate School (AOCS) through NASC graduation. Thus, we rely on Tape I primarily to learn about the period from arrival at Pensacola to completion of NASC.

(2) CNATRA-ATJ Tape II: Supplied by CNATRA in late July, 1986, this data set consists of 9,787 ATJs, covering the period from January, 1982 to June 25, 1986. For our analysis, a subfile was created to represent the 2464 SNPs and SNFOs who reported to NASC between January 1, 1983 and June 30, 1984 -- the most recent "cohorts" whose members had sufficient time to have completed (or been attrited from) training by July, 1986. Because some records for students who attrited prior to completion of NASC were missing from this file, Tape II provides less reliable estimates of student attrition during the early stages of the aviation training program than Tape I. On the other hand, the Tape III data do permit analyses of attrition rates during flight training.

(3) CNATRA-ATJ Tape III: In late August, 1986, CNATRA supplied this data tape, which represents 10,311 candidates who entered training between January, 1982 and August 25, 1986. This tape closely parallels CNATRA-ATJ Tape II, but has the advantage of additional cases and more complete records of AQT/FAR scores. As with the CNATRA-ATJ Tape II, we analyzed records only for the "cohort" of 2464 SNPs and SNFOs who reported to NASC between January of 1983 and June of 1984. Tape III, like Tape II, is missing records for some of the students who arrived at Pensacola during this period but failed to graduate from NASC. Thus it is not as useful as Tape I for investigating the early stages of training. However, CNATRA-ATJ Tape III was crucial, along with Tape II, in the flowline analysis of student progress through the flight training pipelines. And Tape III serves as the primary data source for our investigation of the impact of major field, AQT/FAR scores, and race/ethnic background on training success among SNAs.

2.2.2 *Johns Hopkins University (JHU)-ATJ Data*

Our initial attempts to analyze the computerized CNATRA-ATJ files sent to us in the early stages of the project led to several false starts, due to empty data tapes or grossly unacceptable levels of missing data on key variables such as AQT/FAR or aviation training performance

scores. As a result, the CNATRA project liaison provided us with ATJ data in hard copy form, and from these we built a computerized data file for 1800 SNAs who completed or attrited from naval aviation training during the second half of 1984. This data file has its limitations. Like Tapes II and III, records are missing for some students who attrited prior to completion of NASC. Furthermore, the date of graduation or attrition, not entry, defined the population of candidates represented on this file, and the absence of complete information on entry cohorts interferes with estimation of attrition rates. On the other hand, the JHU-ATJ enhanced data file contains, in addition to the information routinely included in CNATRA's computerized ATJ files, important, detailed information on the number and types of student downs and review boards during specific phases of naval aviation training.<*> Thus, this data file permitted in-depth analyses of risk factors and determinants of training success that were not possible with the three standard computerized CNATRA-AJT tapes. Computerization of these data were completed first for the 710 SNPs represented in the hard copy records, and only that subset of the data file are used in the analyses reported below.

2.2.3 *NASC Student Information Survey*

An important objective of this project was to enhance the quality and scope of data available for research aimed at increasing productivity in naval aviation training. To this end, our research team designed and implemented a Student Information Survey (Mod-1), to be adminstered upon NASC entry to all AOCS and APFI assessions. This 18-page questionnaire collects extensive student demographic and biographic data, in-depth information on students' educational and military background, student orientation and preparation for aviation and the military, and selected social-psychological characteristics (see Appendix A).

<*> CNATRA routinely keeps records of student downs and review boards on hard copy ATJ forms but not on the computerized files.

Information collected in this survey of NASC accessions was subsequently merged with NASC grade records, also computerized by our research team. As it stands, this computerized NASC Student Information Survey/Grade Card file provides: (1) a source of extensive baseline data for monitoring the profile of accessions in naval aviation training over time; and, (2) a means for comprehensive assessment of determinants of success in the early stages of aviation training. But this is only part of the potential usefulness of this file: Merged with computerized CNATRA-ATJ data, it can provide much more comprehensive information than has existed to date about which factors predict success and failure downstream in the naval aviation training pipeline.

For this report, the NASC Student Information Survey data collected between May and September of 1986 are used to provide in-depth profiles of approximately one thousand recent accessions. Regretably, within the timeframe of this research contract, there could not be sufficient accumulation of Student Information Survey and associated NASC performance data to permit analyses of risk factors in NASC training. However, recommendations for future research based on this newly-created data system are presented in later sections of this report.

2.2.4 *Interviews with Naval Aviators*

A final, major component of the research design involved in-depth interviews with more than two hundred experienced naval aviators and SNAs at both training and operational settings: NAS Pensacola, NAS Whiting Field, NAS Corpus Christi, NAS Kingsville, and NAS Oceana. At NAS Oceana, interviewers met with FRS students who were recent graduates of naval aviation training, and with exemplary naval aviators who have the benefit of operational field experience, including department heads and FRS instructors. At NAS Whiting, NAS Corpus Christi, NAS Kingsville and NAS Pensacola, interviews were conducted with students at various phases of training, recent attrites and DOR's, platform and flight instrutors, company officers, drill instructors, AITC instructors and department heads.

Interviews were conducted by the project's professional research staff of Ph.D. social psychologists and sociologists. The staff included one white female, two Black males, three white males, and one Asian male. Most sessions matched two interviewers with 4 to 8 interviewees. Interviewing teams typically contained one minority and one nonminority member, although some interviews with minority respondents were conducted by teams of minority interviewers in order to minimize social desirability effects on responses to race-sensitive issues. Because low minority representation (especially among Blacks) and disproportionate minority attrition have been defined as persistent problems in naval aviation training and as important topics in this research, every effort was made to interview the maximum number of Black and other minority aviators available at each site.

Interview schedules were designed to make optimal use of the expertise, experience, and perspectives of each of the specific subgroups of naval aviators. Training command and FRS staff interviews focused on the diverse expertise, insight, and experience of these naval personnel who had successfully completed the aviation training program and had gone on to gain experience in fleet and shore operational settings. Interviews were conducted with SNAs representing the various communities (SNP, SNFO), pipelines (Jet, Maritime, Helo Pilots; Tactical, Radar Intercept, Overwater Jet Navigators), and stages of naval aviation training (NASC, Primary/Basic, Intermediate, Advanced). Figure 2.2.1 presents a matrix showing the interview types and sites. Appendix B includes samples of the interview schedules.

The interviews yielded a detailed portrait of naval aviation training and a rich body of suggestions for enhanced productivity.

FIGURE 2.2.1

INTERVIEW SITES

	Training	Fleet
Jets	NAS Kingsville (16)	NAS Oceana (26)
Helo	NAS Whiting Field (11)	
Maritime	NAS Corpus Christi (16)	
SNFO	NAS Pensacola (17)	NAS Oceana (18)
Primary	NAS Whiting Field (15) NAS Corpus Christi (16)	
AOCS/APFI	NASC Pensacola (72)	

Note: Number of interviews in parentheses.

2.3 STATISTICAL ANALYSES AND METHODOLOGICAL ISSUES

Statistical analyses were used for three general tasks: the flowline analysis of student attrition and completion (Chapter Three); the assessment of the impact of undergraduate technical major and AQT/FAR scores on student performance and of the implications of student race/ethnicity (Chapter Four); and the presentation of profiles of contemporary naval aviation accessions (Chapter Five). Each of these tasks brought its own requirements for analytic strategies. The flowline analysis depended on selective use of multiple data sets, and involved important comparisons among subpopulations. Challenging problems of selection criterion validation were presented in the assessment of technical major and AQT/FAR scores, and the consideration of patterns for minority and nonminority SNAs made innovative use of reliability theory. In constructing profiles of recent NASC accessions, apt subgroup comparisons and judicious selection of observations from the rich body of available information were crucial.

Among the multiple sources of data for this project, many limitations exist. All our conclusions are necessarily time-bound, based as they are on information pertaining to a relatively brief period during the recent past. In general, we lacked certain broad types of information. The newly-developed NASC Student Information Survey was the only real source of detailed, systematic information about the psychology, motivation, and biography of candidates, and these data must mature before their potential usefulness can be fully realized. Interviews provided sketches of the training process, but systematic monitoring of this process would have been invaluable. As noted earlier, each set of computerized performance records was lacking some important elements.

In this project, however, as in most others, there is strengh in numbers. The multiple forms and sources of data used here allowed for complementary and compensating approaches to the research questions, and sometimes provided the opportunity for convergence and confirmation. Overall, these data justify considerable confidence in the conclusions reported in the following chapters.

CHAPTER THREE

Attrition Rates and Flowline:

The Aviation Training Pipeline

3.1 INTRODUCTION

This chapter traces the progression of Student Naval Pilots (SNPs) and Student Naval Flight Officers (SNFOs) through the aviation training process, from the day they reported to Naval Aviation Schools Command (NASC) through the day they completed or attrited from training. Rates of attrition are reported separately for accessions representing the various procurement sources, for the SNP and SNFO communities, and within community for the various pipelines -- Jet, E2/C2, Maritime, and Helo for SNPs; Navigation, ATDS, Radar Intercept Officer, Tactical Navigation, and Overwater Jet Navigation for SNFOs. We also catalog information on average training time among candidates who completed the aviation training program.

3.2 DATA

The flowline analysis uses three of the data sets described in Chapter Two: CNATRA-ATJ Tapes I, II, and III. Each contains uniquely useful information for the analysis of flowline and attrition rates. As noted earlier, CNATRA-ATJ Tape I suffers from missing data on outcomes at more advanced stages of training; however, it contains particularly thorough data on the outcomes during early stages of training, and thus will be our source for the analysis of pre-entrance and NASC attrition. CNATRA-ATJ Tapes II and III provided less complete information about students who attrited during early stages of training but had complementary strenths and weaknesses as sources of data on flight training. Information on Tape III filled certain gaps left in the Tape II data. On the other hand, Tape II allowed for indirect estimation of some of the missing attrition information. Thus, CNATRA-ATJ Tapes II and III are used together as our sources on the flow of SNAs through flight training.

3.3 FLOWLINE ANALYSIS

The flowline analysis of attrition, reported in Tables 3.1 through 3.6, is discussed in three sections: "pre-entrance" attrition; attrition from NASC; and attrition during flight training.

3.3.1 *Pre-entrance attrition*

The week following the initial arrival of AOCS accessions at NASC is called the pre-outpost period, or "Poopey Week." During this period, new accessions undergo official screening and are not yet formally considered candidates in the aviation training program. Should they be attrited during Poopey Week, they are not recorded in official NASC attrition counts. Pre-outpost attrition is, however, important to our understanding of the overall process of losses from the aviation training program. Although APFI accessions do not have a formal Poopey Week, there is some initial attrition in this group, resulting from failures of physical exams at NAMI or changes of mind about entering training. We will refer to such losses before entering AOCS or APFI as "pre-entrance" attrition.

During the 38-month period represented in CNATRA-ATJ Tape I, 7805 new accessions arrived at NAS Pensacola to be trained as naval aviators, 4278 reporting to AOCS and 3526 to APFI, respectively. Of this group, 900 became pre-entrance attrites, representing an 11.5% loss in the initial period before formal training began.<*> (See Table 3.1.) The vast majority of the pre-entrance attrites, some 842 of them, were AOCS accessions. Table 3.2 reveals that Poopey Week attrition represents a 19.7% loss of AOCS accessions, while pre-entrance attrition among APFI accessions is estimated to be 1.6%.

<*> The data indicate that pre-entrance attrition does fluctuate over time. By combining data for the three years represented on CNATRA-ATJ Tape I, we intended to minimize the impact of short-term fluctuations and of any sporadic omissions in the data file.

Although modest in size, the attrition rate for pre-commissioned, APFI accessions reveals an interesting pattern of variation by procurement source. Our records show that in the 38-month time span represented in CNATRA-AJT Tape I, there was not one pre-entrance attrite among the 1037 U.S. Marine, U.S. Marine Reserve, and U.S. Coast Guard accessions. Among the 56 APFI pre-entrance attrites whose procurement source could be identified, 38 had entered via NROTC program and the other 18 were U.S. Naval Academy accessions. (See Table 3.3).

3.3.2 *Naval Aviation Schools Command Attrition*

After pre-entrance attrition, 6905 SNAs represented on CNATRA-ATJ Tape I were offically accessed at NASC, almost evenly divided between AOCS (with 3436 candidates) and APFI (with 3468 candidates). Of this group, 662 candidates attrited during NASC, placing the overall attrition rate for this phase of training at 9.6%. The great majority of the NASC attrites, 577 of them, were AOCS candidates, producing an AOCS attrition rate of 16.8%, in contrast to a 2.5% attrition rate for APFI candidates. AOCS training is approximately twice as long as the APFI program, but the difference in training time can only be part of the explanation for an AOCS attrition rate nearly seven times as large as the APFI rate: Differences in candidate attributes and divergent training philosophies, in some combination, are presumably also reflected in these discrepant patterns.

Combining the pre-entrance and NASC attrition figures, we see in Table 3.2 that a total of 1419 AOCS candidates had left training before completing NASC -- a loss of 33% of the AOCS accessions who arrived at Pensacola. The comparable total loss of APFI accessions prior to NASC completion is 143 or 4.1%. Across the two groups of accessions, 1562 of those who arrived at Pensacola, or 20%, left before NASC graduation. (See Table 3.1.)

Table 3.1

Attrition Rates (Percentages) by Training Stage

	CNATRA-ATJ Tape I
Pre-Entrance	11.53 (7805)
NASC	9.59 (6905)
Overall Preflight	20.01 (7805)

	SNP			SNFO	
	Tape I	Tape II	Tape III	Tape II	Tape III
Primary	-	11.09 (1461)	11.54 (1534)	-	-
Primary & Intermediate	-	-	-	16.69 (617)	17.05 (645)
Pipeline	-	10.62 (1299)	9.06 (1357)	22.76 (514)	22.24 (535)
Overall Flight	-	20.53 (1461)	19.56 (1534)	35.66 (617)	35.50 (645)

Table 3.2

Comparisons of Attrition Rates for AOCS and APFI Assessions
(4 Data Sources)

	Tape I	
	AOCS	APFI
Pre-entrance	19.68 (4278)	1.64 (3526)
NASC	16.79 (3436)	2.45 (3468)
Overall Preflight	32.87 (4278)	4.05 (3526)

	SNP				SNFO			
	Tape II		Tape III		Tape II		Tape III	
	AOCS	APFI	AOCS	APFI	AOCS	APFI	AOCS	APFI
Primary	13.55 (369)	10.26 (1092)	13.61 (404)	10.73 (1081)	-	-	-	-
Basic & Intermediate	-	-	-	-	17.54 (285)	15.96 (332)	18.36 (305)	15.66 (332)
Pipeline	9.09 (319)	11.12 (980)	7.74 (349)	9.64 (965)	21.70 (235)	23.66 (279)	21.69 (249)	23.21 (280)
Overall Flight	21.41 (369)	20.24 (1092)	20.30 (404)	19.33 (1081)	35.44 (284)	35.84 (332)	36.07 (305)	35.24 (332)

Table 3.3

Pre-entrance and NASC Attrition Rates within Community and Procurement Source (N=7529)
(Data Source: CNATRA-ATJ Tape I)

	USNA	NROTC	USMC	USMCR	USCG	ALL APFI	AOCS
SNP							
Pre-entrance	1.91 (629)	3.20 (656)	.00 (324)	.00 (570)	.00 (143)	1.42 (2322)	22.39 (2639)
NASC	.32 (616)	2.83 (635)	1.86 (323)	2.28 (569)	.00 (143)	1.70 (2286)	14.36 (2048)
Overall Preflight	2.22 (629)	5.94 (656)	1.86 (324)	2.28 (570)	.00 (143)	3.10 (2322)	33.53 (2639)
SNFO							
Pre-entrance	1.80 (334)	3.53 (481)	.00 (50)	.00 (64)	*	2.47 (929)	14.87 (1358)
NASC	2.44 (328)	6.28 (462)	2.00 (50)	3.13 (64)	*	4.43 (904)	19.25 (1153)
Overall Preflight	4.20 (334)	9.59 (481)	2.00 (50)	3.13 (64)	-	6.78 (929)	31.25 (1358)

Table 3.4

Pipeline Attrition Rates
(Data Sources: CNATRA-ATJ Tape II, III)

	Tape II		Tape III	
STUDENT NAVAL PILOTS (intermediate & advanced stages)	%	N	%	N
Jet Pipeline	10.10	(386)	6.49	(447)
E2/C2	-	(2)	14.29	(35)
Maritime	6.06	(231)	1.74	(230)
Helo	4.80	(542)	1.49	(536)
Unknown	-	(138)	-	(109)
STUDENT NAVAL FLIGHT OFFICERS (advanced stage)	%	N	%	N
NAV Pipeline	8.55	(117)	3.42	(117)
ATDS	14.63	(41)	2.63	(38)
RIO	8.45	(71)	5.56	(72)
Tactical Nav.	5.04	(119)	0.00	(117)
Overwater Jet	9.72	(72)	4.17	(72)
Unknown	-	(94)	-	(119)

Table 3.5

SNP Flight Training Attrition Rates by Stage, within Procurement Source (Data Source: CNATRA-ATJ Tape II)

	USNA	NROTC	USMC	USMCR	USCG	AOCS
Primary	9.17 (229)	8.37 (263)	12.27 (163)	11.71 (33)	11.11 (45)	13.55 (369)
Pipeline	10.58 (208)	7.47 (241)	12.59 (143)	12.24 (294)	27.50 (40)	9.09 (319)
Jet Pipeline	3.08 (65)	7.04 (71)	11.76 (34)	17.78 (90)	.00 (0)	9.82 (112)

Table 3.6

SNFO Flight Training Attrition Rates by Stage, within Procurement Source (Data Source: CNATRA-ATJ Tape II)

	USNA	NROTC	USMC	USMCR	AOCS
Basic/ Intermediate	8.10 (111)	22.03 (177)	6.25 (16)	10.00 (20)	17.54 (285)
Pipeline	33.33 (102)	15.94 (138)	6.67 (15)	50.00 (18)	21.70 (235)

3.3.3 *Attrition During Flight Training*

CNATRA-ATJ Tapes II and III provide a profile of SNP and SNFO attrition from flight training.

3.3.3.1 Student Naval Pilots

Our best data on SNP attrition during flight training, provided by CNATRA-ATJ Tapes II and III for the period January 1983 through June 1984, suggest that 11% to 12% of the SNPs attrited during primary training. Of those that remained, 9% to 11% attrited during intermediate and advanced flight training, most of these during the longer, advanced training. Thus the Overall Flight attrition rate for SNPs is approximately 20%. (See Table 3.1.)

We can combine the information provided by Tapes II and III about flight training attrition among SNPs with our best, Tape I information about pre-entrance and NASC attrition to estimate total attrition/completion rates. In view of the very large discrepancy between AOCS and APFI attrition during the early training stages, however, a single estimate that pooled AOCS and APFI accessions would not be very useful. Thus we use the Table 3.3 Overall Preflight attrition rates for SNPs who entered through AOCS and APFI, together with the Table 3.2 estimates of Overall Flight attrition rates for these two groups (taking the mean of the Tape II and Tape III estimates), to learn that approximately 47% of the SNPs who entered through AOCS attrite before completing aviation training. In other words, 53% of the SNPs who entered AOCS eventually earned their wings. Among SNPs who entered via APFI, 22% attrited before completing training and 78% earned their wings.

Table 3.4 reveals that the report of overall SNP attrition during intermediate and advanced flight training should be conditioned by acknowledgement of pronounced differences among pipelines. In the jet pipeline, intermediate and advanced attrition is estimated by CNATRA-ATJ Tapes II and III at 6% and 10%, respectively. In the much smaller E2/C2 pipeline, for which

only CNATRA-ATJ Tape III was capable of producing an estimate, the figure is about 14%. In contrast, the estimates for the Maritime pipeline are smaller, 2% and 6%, and for the Helo pipeline the estimates are 1% and 5%.

One of the most interesting patterns in the flight training attrition data is evident in Table 3.2. We had earlier observed much higher pre-entrance and NASC attrition among AOCS accessions than among APFI accessions. A relatively high attrition rate among SNPs who entered through AOCS rather than APFI exists in primary flight training as well, although Table 3.2 reveals the discrepancy between the two groups to be greatly reduced. However, in intermediate and advanced flight training, the direction of the difference between these two groups is reversed: At these later stages of training, SNPs who entered through AOCS show a slightly lower attrition rate than the pre-commissioned officers who entered directly into APFI.

Again, however, more detailed examination suggests qualifications. As indicated in Table 3.5, attrition rates during later stages of flight training vary for APFI *accessions from different* procurement sources. SNPs representing the U.S. Marine Corps, the U.S. Marine Corps Reserves, and the U.S. Coast Guard programs, the groups that showed no pre-entrance attrition at all, have particularly high rates of attrition during intermediate and advanced flight training. Among APFI accessions, it was those entering through NROTC and the U.S. Naval Academy whose early attrition was relatively high, but during intermediate and advanced flight training, these candidates have lower attrition rates than other APFI procurement groups, in the range of the attrition rate for AOCS accessions. Table 3.5 reports attrition rates for jet pipeline SNPs separately, and here we see attrition rates among NROTC and U.S. Naval Academy accessions to be particularly low, even lower than the attrition rate for AOCS accessions assigned to the jet pipeline.

These differences among procurement groups in the pattern of attrition over the succession of training phases raise interesting questions for future investigation by CNATRA policy-makers.

3.3.3.2 Student Naval Flight Officers

CNATRA-ATJ Tapes II and III also provide the best information about SNFO attrition from flight training during the January 1983 through June 1984 period. In the basic/intermediate stage, the attrition rate for SNFOs was approximately 17%. During advanced flight training, 22% or 23% of the SNFOs attrited. Early and late in flight training, SNFO attrition is considerably higher than SNP attrition, and Table 3.1 reveals the overall loss of SNFOs during flight training to be about 36%, whereas the comparable overall rate for SNPs was about 20%. Combining Table 3.3 and Table 3.2 rates for Overall Preflight and Overall Flight attrition for SNFOs who entered through AOCS and APFI, we can derive total attrition rates for the two groups of SNFOs. Approximately 56% of the SNFOs who entered through AOCS attrited before completing aviation training, the other 44% eventually earning their wings. And among SNFOs who entered via APFI, 40% attrited before completing training while 60% earned their wings.

Attrition during advanced flight training does seem to vary among the five major SNFO pipelines. CNATRA-ATJ Tape III provides the most reliable estimates here, and suggests that whereas the attrition rate approximates 5% for the Tactical Navigator (TN) pipeline, it is higher for all other pipelines, highest of all for ATDS students. (See Table 3.4.) The reported within-pipeline attrition rates for advanced flight training must be considered only as minimum estimates, however, because pipeline affiliations could not be determined for a number of SNFOs who attrited during advanced training.

For the SNFOs as for the SNPs, the higher attrition of AOCS than APFI accessions during early stages of training is reversed during advanced flight training. Of the SNFOs who make it to advanced flight training, AOCS accessions have lost their statistical disadvantage and even fare slightly better than their counterparts who entered APFI directly.

Among SNFOs who had been APFI accessions, NROTC and the U.S. Naval Academy are the only two procurement sources represented in large enough numbers to provide stable separate estimates of attrition rates. Table 3.6 reveals that SNFOs who had entered via NROTC were more likely than U.S. Naval Academy accessions to attrite during early stages of flight training, but it was those who entered from the U.S. Naval Academy who were more likely to attrite during advanced flight training.

3.4 TRAINING TIME FOR STUDENT NAVAL AVIATORS WHO COMPLETED THE PROGRAM

This analysis uses the official training time targets for AOCS and APFI accessions in the various SNP and SNFO pipelines as benchmarks. Against these, we examine the actual average days in training for SNAs from each procurement source in each pipeline. Information on the distribution of days in training for AOCS and APFI accessions who eventually completed the SNP and SNFO programs are presented in Tables 3.7 and 3.8.

The top rows of Tables 8 and 9 present, for AOCS and APFI accessions, the official training time targets for each pipeline. The second panel of data, Total Days in Class, represents the sum of days actually spent in all phases, from the beginning day of the phase to the day of detachment. These figures provide a rough estimate of the length of active training, although they might better be described as a maximum length of active training, because slack periods due to maintenance delays, weather conditions, and the like, are encompassed in the Days in Class averages.

The third, fourth, and fifth panels of Tables 3.7 and 3.8 represent Days Between Phases, Days Waiting for Class, and the sum of these, Total Days Not in Class. The sixth panel, Total Days on Program, represents the sum of Days in Class and Days Not in Class, the length of time from arrival at Pensacola to detachment from the advanced phase of flight training.

For panels 2 through 6, we report the mean number of days spent and the standard deviation of the distribution. For Days Between Phases, Days Waiting for Class, and Total Days Not in Class, this mean is also presented as a percentage of the official training time target for that pipeline, entitled "% of plan." For Total Days in Class and Total Days in Program, the difference between actual training days and the target is presented as a percentage of the target, entitled "% Over Target."

Table 3.7

SNP Training Time, within Procurement Source and Pipeline
(Data Source: CNATRA-ATJ Tape III)

	AOCS				APFI			
	Jet	E2/C2	Maritime	Helo	Jet	E2/C2	Maritime	Helo
	N=(142)	(16)	(77)	(80)	(267)	(13)	(135)	(435)
1) Offical Planned Days	560	546	413	406	504	490	357	350
2) Total Days in Class								
Mean	619.19	528.31	465.17	525.17	587.74	486.69	400.90	466.55
(S.D.)	67.15	45.33	55.09	83.68	81.24	91.13	72.61	72.16
% Over Target	10.57	-3.23	12.86	29.35	16.62	-.68	12.30	33.30
3) Total Days Between Phases								
Mean	129.46	191.64	48.75	50.69	87.08	131.69	41.81	26.60
(S.D.)	92.83	50.97	52.83	73.34	63.19	59.48	44.01	46.65
% Of Plan	23.12	35.10	11.80	12.49	17.28	26.88	11.71	7.60
4) Total Days Waiting for Class								
Mean	16.96	8.00	25.46	13.51	20.56	20.15	32.49	21.05
(S.D.)	50.80	21.86	30.52	21.60	42.84	33.50	45.38	42.77
% of Plan	3.03	1.47	6.16	3.33	4.08	4.11	9.10	6.01
5) Total Days Not in Class								
Mean	143.25	196.21	73.37	64.74	106.26	151.85	75.63	46.32
(S.D.)	83.57	43.47	57.23	71.45	66.89	65.58	64.86	65.33
% of Plan	25.58	35.94	17.77	15.95	21.08	30.99	21.18	13.23
6) Total Days on Program								
Mean	768.85	727.69	542.28	589.81	698.45	644.92	473.56	521.34
(S.D.)	82.16	50.15	58.71	78.66	94.85	75.77	85.39	86.37
% Over Target	37.29	33.28	31.30	45.27	38.58	31.62	32.65	48.95

Note: Due to different amounts of missing data for each component, [illegible]

Table 3.8

SNFO Training Time, within Procurement Source and Pipeline
(Data Source: CNATRA-ATJ Tape III)

	AOCS				APPI			
	ATDS	RIO	TN	OJN	ATDS	RIO	TN	OJN
	(23)	(40)	(42)	(29)	(13)	(28)	(38)	(42)
1) Official Planned Days 413	364	378	336	336	308	322	280	280
2) Total Days in Class								
Mean	515.43	483.29	460.34	468.30	409.67	400.25	367.43	371.04
(S.D.)	43.86	50.64	68.25	52.28	13.53	37.53	49.78	35.72
% Over Target	41.60	27.85	37.01	39.38	33.01	24.30	31.23	32.51
3) Total Days between Phases								
Mean	41.23	18.40	27.60	17.39	85.00	14.69	18.36	14.18
(S.D.)	32.84	20.51	60.17	12.06	38.06	15.02	14.60	9.94
% of Plan	11.33	4.87	8.21	5.18	27.60	4.56	6.56	5.06
4) Total Days Waiting for Class								
Mean	22.05	15.28	10.52	24.72	20.78	23.89	19.52	31.17
(S.D.)	24.95	20.94	12.01	38.21	19.45	28.18	22.14	33.46
% of Plan	6.06	4.04	3.13	7.36	6.75	7.42	6.97	11.13
5) Total Days Not in Class								
Mean	62.05	34.08	38.25	42.71	97.20	39.60	37.27	45.41
(S.D.)	33.98	29.90	68.92	37.26	28.81	35.77	28.36	38.06
% of Plan	17.05	9.02	11.38	12.71	31.56	12.30	13.31	16.22
6) Total Days on Program								
Mean	575.70	527.73	498.62	512.97	514.17	445.21	423.96	437.24
(S.D.)	48.01	36.79	82.74	59.06	41.98	51.16	99.86	76.36
% Over Target	58.16	39.61	48.40	52.67	66.94	38.26	51.41	56.16

Note: Due to different amounts of missing data for each component, panels 2 + 5 ≠ 6 or 3 + 4 ≠ 5.

3.4.1 *Pilot Training Time*

Looking first at Total Days in Class, among the SNPs represented in Table 3.7 who had been AOCS accessions, the E2/C2 candidates finished their program a bit ahead of schedule, the Jet and Maritime SNPs spent 11% and 13% more days in class than officially scheduled, and the Helo SNPs spent 29% more time than scheduled. This pattern is mirrored for the APFI accessions in the various pipelines.

In terms of Total Days on Program, the SNPs in all pipelines actually spent from 30% to 50% more days than officially scheduled. Time between phases was particularly long for the Jet and E2/C2 pipelines.

3.4.2 *Naval Flight Officer Training Time*

In general, SNFO training exceeds training days targets by a greater margin than SNP training. Table 3.8 reveals that for AOCS and APFI accessions in the SNFO program, Days in Class ranged from 24% to 42% over the officially specified target, with RIOs having the smallest proportion of training days over target. Looking at Total Days on Program, as the actual outcome, SNFOs in the various pipelines spent from 38% to 67% more time from the beginning of training to the end than designated by the official training days target.

CHAPTER FOUR

Impact of the Student's Personal Characteristics On Training Success

4.1 INTRODUCTION

This chapter presents statistical analyses of three student characteristics to determine their impact upon the student's success in aviation training. First, we examine the implications of having a technical undergraduate major for student outcomes in aviation training. Second, we consider the impact of the student's scores on the AQT/FAR test. Both these analyses are of great interest to Navy decision makers because of the importance of locating valid selection instruments.

Our third set of analyses examines the performance and attrition/completion records of minority SNAs. Attrition rates for minority SNAs have been quite high. Because minorities are becoming a larger and larger proportion of the qualified recruitment pool on which naval aviation depends to meet its personnel needs, Navy planners have a special interest in understanding why minority attrition should be so high and what can be done about it.

The bulk of our analyses use CNATRA-ATJ Tape III data on the NSFOs and NSPs who entered training between January 1983 and June 1984. In some cases, we supplemented these data with records of the 710 SNPs represented in the JHU-ATJ data file. As noted in the Chapter Two description, the JHU-ATJ data have the advantage of containing counts of the downs and review boards a student experienced in each stage of training.

4.2 THE EFFECTS OF HAVING AN UNDERGRADUATE MAJOR IN A TECHNICAL FIELD

As we shall see, in considering the impact of an undergraduate technical major, it is important to distinguish between SNFOs and SNPs.

4.2.1.1 *Student Naval Flight Officers: Performance Scores*

Our first analysis uses CNATRA-ATJ Tape III data to compare SNFOs who did and did not have an undergraduate major in a technical field (using the Navy definition of technical field). It is widely assumed that the more technical training a student has, the better aviator the student will be. Table 4.1 shows the standardized performance scores obtained throughout aviation training by SNFOs who did and did not have an undergraduate technical major. For example, the first line of Table 4.1 shows that 110 students entered aviation training directly into APFI (having already been commissioned) with an undergraduate major in a nontechnical subject; these students made an average score of 46.0 on the academic tests used in APFI. In contrast, exactly 110 other students entered APFI with an undergraduate technical degree and these students averaged 51.6.

However, it is not easy to interpret this difference of 5.6 standardized score points. Supposedly, test scores in each stage of training have a mean of 50 and a standard deviation of 10, but this is not always the case, presumably because of errors in the standardization formulas used by different training squadrons. The left hand column of Table 4.1 shows in parentheses the standard deviation for each set of scores, and in 10 of 18 cases these numbers are below 9 or above 11. In order to compare the various rows in this table and to compare data for SFNOs to data for SNPs, we have restandardized all the data, by simply dividing the difference between the average scores for technical and nontechnical majors by the standard deviation for the particular test.

In our example (line one), the difference of 5.6 divided by 9.43 yields a standardized difference shown in the far right column of the table of +.59. (This is called 'doubly standardized' because it is a standardized difference of the already standardized scores.) This is the largest difference in the table. The second line, which looks at the performance of students with and without technical majors who entered naval aviation through AOCS, shows a difference nearly as large.

Table 4.1

Standardized Performance Scores of Student Naval Flight Officers, with and without Undergraduate Technical Majors

(Standardized Performance Scores)

PROGRAM COMPONENT	(Standard Deviation)	COLLEGE MAJOR Non-Tech(n)	Tech(n)	Doubly Standardized Difference
APFI, Academic	(9.43)	46.0 (110)	51.6 (110)	.59
AOCS, Academic	(9.49)	46.7 (138)	51.6 (81)	.52
BAS, Flight	(9.96)	48.1 (246)	51.4 (189)	.33
Academic	(8.53)	47.6 (249)	50.3 (192)	.32
INT, Flight	(9.11)	47.2 (147)	48.7 (144)	.16
Academic	(8.48)	47.7 (151)	50.8 (144)	.36
ADV, Flight				
ATDS	(2.86)	48.2 (28)	49.1 (9)	.31
OJN	(7.50)	51.2 (36)	52.1 (31)	.12
RIO	(9.54)	51.0 (28)	54.2 (36)	.36
TN	(9.68).	50.8 (43)	53.8 (64)	.31
			Weighted Mean:	(.28)
ADV, Academic				
ATDS	(6.53)	69.3 (28)	72.1 (9)	.43
OJN	(9.61)	48.9 (36)	51.6 (30)	.28
RIO	(8.70)	47.5 (28)	51.8 (36)	.49
TN	(11.01)	49.1 (43)	52.2 (64)	.28
			Weighted Mean:	(.35)
ADV, Simulator				
ATDS	(6.55)	47.8 (28)	45.9 (9)	-.29
OJN	(11.70)	50.0 (36)	53.4 (31)	.29
RIO	(9.05)	50.3 (28)	55.3 (36)	.55
TN	(11.54)	51.9 (43)	54.4 (64)	.22
			Weighted Mean:	(.26)

Throughout the rest of the training program, students with technical college majors have an advantage in the SNFO program. In basic flight and academic work, they score about a third of a standard deviation higher. In intermediate training, students with technical majors have academic scores about a third of a standard deviation higher and flight scores which are about one-sixth of a standard deviation higher. After the students enter the various specialized pipelines, the differences continue. Differences in flight performance are typically around three-tenths of a standard deviation; they range from .12 to .36, and the difference when the four pipelines are pooled (using an average weighted by the number of candidates in each pipeline) is .28 standard deviations. Differences in academic performance in advanced training are about the same magnitude, with an overall weighted mean difference of .35. In simulator training there is one noticeable reversal -- the small number of technically-trained SNFOs in the ATDS program make scores below that of the students with nontechnical majors in this pipeline. In the other three pipelines students with technical majors performed better; the overall mean difference is .26.

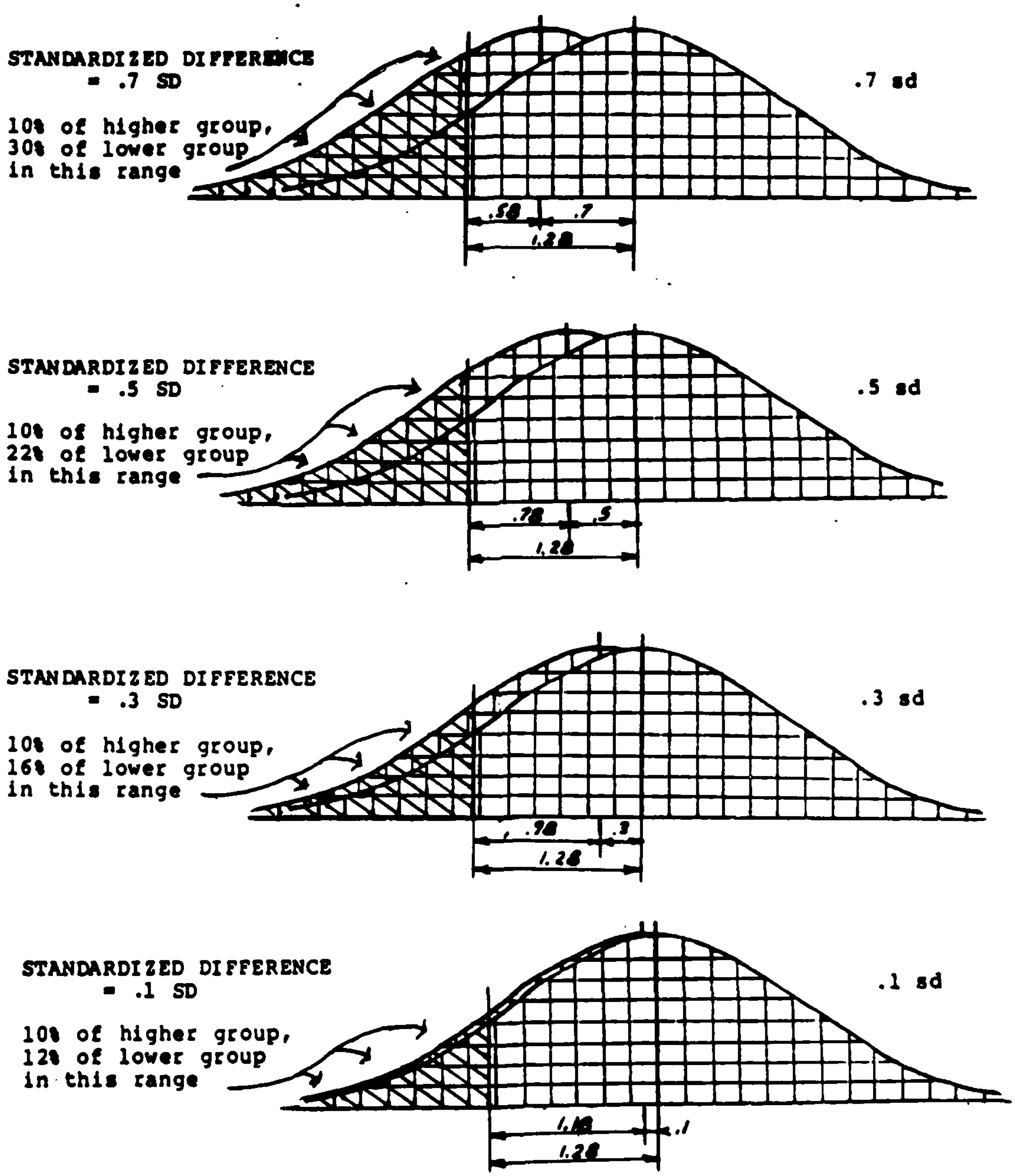
4.2.1.2 *Evaluating the Magnitude of Differences between Groups*

The graphic distributions in Figure 4.1 provide a sense of how large these differences are. Figure 4.1 assumes that standardized performance scores are normally distributed, and presents graphically the differences that would appear if two groups of students differed by .7, .5, .3, or .1 standard deviations.

The uppermost figure shows the distributions for two groups of students if one group out-performed the other by .7 standard deviations. We see that although there is considerable overlap in these distributions, the poorer performing group appears to be noticeably weaker. If 10% of the high performing group were considered to be achieving at a substandard level, these would be the students to the left of the leftmost vertical line shown in the graph. However, 30% percent of the students from the poorer performing group would score to the left of this line,

three times as many. A selection device which distinguished this performance accurately would be quite useful.

Figure 4.1 Graphic Display of Magnitude of Several Standardized Differences Between Two Groups of Students



The second graph of Figure 4.1 again shows students divided into two groups, one of whom performs .5 standard deviations above the other on average. Again there is a clear difference between the two distributions, and if we draw a vertical line again representing the point at which 10% of the students from the higher group are performing in a substandard manner, we would find that 22% of the students from the lower group performed below this level.

The third graph of Figure 4.1 shows a difference of .3 standard deviations. Here the two distributions are not as different. Most of the students in the so-called poorer performing group would score about as well as most students from the higher performing group; if 10% of students from the higher performing group were considered to be performing in a substandard manner, then only 16% of the students from the lower group would be performing that badly. If this were considered the cutting point for successfully completing training, then 90% of the high performing group would pass and 84% of the low group would pass; it is difficult to justify using this as a selection device unless there were far more applicants than one needed.

We need to distinguish between the policy implications of differences resulting from some method of improving student performance (such as a new training curriculum) and the policy implications of a difference of the same size resulting from a selection criterion (such as having a technical college major). A curriculum change which could improve the performance of *all* students by .3 standard deviations, thereby shifting all students from the lefthand curve to the righthand curve, would clearly be a useful improvement to naval training (depending on costs, of course). But when the pool of applicants is limited, a difference of only .3 standard deviations is probably not large enough to justify use of that selection criterion.

Finally, the lowest graph in Figure 4.1 shows the difference between two groups which differ by only .1 standard deviation. Clearly a selection criterion which discriminates between groups that differ by only a tenth of a standard deviation is too weak to be of much value.

Using the graphs from Figure 4.1 as a guideline to interpret the results of Table 4.1, one would seem justified in giving preference to students with technical majors in the SNFO program. Although not all of the differences in the table are larger than .3 standard deviations, many of them are, and the differences in AOCS/APFI performance scores are greater than .5 standard deviations. If a sufficiently large number of candidates is available, giving preference to those with technical majors would not seem unreasonable.

4.2.1.3 *Student Naval Flight Officers*: *Attrition*

Table 4.2 shows the SNFO attrition rates for those with and without technical majors. The lower scores that we saw for the SNFOs with nontechnical college majors are reflected in the higher attrition rates for these students as well. They are not more likely to attrite during the first week (the "pre-AOCS" and "pre-APFI" rows), suggesting that their motivation for an aviation career is not weaker. However, they are slightly more likely to attrite from AOCS, noticeably more likely to attrite from primary, and have attrition rates which are higher in both intermediate and advanced training. Overall, in flight training the attrition rate of SNFOs with nontechnical majors, 18%, is over twice as large as the 7% rate for SNFOs who come with a technical major; and combining all stages of training from NASC through advanced (but excluding losses during the first week before AOCS and APFI begin), SNFOs with non-technical majors have a 34% attrition rate, half again as large as the 21% rate for SFNOs with technical majors.

Table 4.2

Attrition Rates for Student Naval Flight Officers with or without Undergraduate Technical Majors

(Attrition Rates)

PROGRAM COMPONENT	COLLEGE MAJOR Non-Tech (n)	Tech (n)	Difference
pre-APPI	2% (167)	5% (168)	+ 3%
pre-AOCS	11% (270)	10% (146)	- 1%
APPI	7% (117)	8% (120)	+ 1%
AOCS	26% (191)	22% (106)	- 4%
BASIC	11% (253)	4% (194)	- 7%
INTERMEDIATE	3% (225)	1% (187)	- 2%
ADVANCED			
ATDS	4% (28)	0 (9)	- 4%
OJN	3% (37)	6% (32)	+ 3%
RIO	10% (31)	3% (37)	- 7%
TN	0 (43)	0 (64)	0
Total, ADV	4% (139)	2% (142)	- 2%
Total, AOCS/APPI	18%	15%	- 3%
Total, BAS - ADV	18%	7%	-11%
Total, AOCS/APPI-ADV	34%	21%	-13%

4.2.2.1 *Student Naval Pilots: Performance Scores*

Table 4.3 shows performance score results for SNPs, with a generally different result than that reached for SNFOs. In AOCS and APFI the SNPs with technical college majors outperformed those with nontechnical majors on the average, but the differences here, .42 and .43, are noticeably smaller than the corresponding differences of .52 and .59 for SNFOs.

Since SNPs and SNFOs are going through exactly the same AOCS/APFI program at the same time, it is surprising that there should be any difference between the two groups. We hypothesize that the benefit of a technical college major is slightly smaller for SNPs due to the higher level of motivation that SNPs might feel compared to SNFOs, because of having achieved entry into the pilot training program. Among students with nontechnical majors, SNPs may be more highly motivated, working harder and thus closing a bit of the gap between themselves and their classmates with technical backgrounds.

Table 4.3

Standardized Performance Scores of Student Naval Pilots, with and without Undergraduate Technical Majors

(Standardized Performance Scores)

PROGRAM COMPONENT	(Standard Deviation	COLLEGE MAJOR Non-Tech(n)	Tech(n)	Doubly Standardized Difference
APPI, Academic	(8.71)	48.6 (469)	52.3 (372)	.42
AOCS, Academic	(8.33)	50.4 (184)	54.0 (130)	.43
PRI, Flight	(9.30)	51.3 (671)	54.4 (528)	.33
Academic	(14.03)	50.5 (562)	55.7 (404)	.37
INT, Flight				
E2C2	(5.50)	50.9 (21)	51.0 (10)	.02
Helo.	(6.30)	54.5 (323)	55.3 (181)	.13
Jet	(7.43)	52.0 (203)	52.6 (210)	.08
Mari.	(6.72)	56.4 (94)	58.0 (109)	.24
			Weighted Mean:	(.13)
INT, Academic				
E2C2	(11.63)	51.0 (18)	50.3 (9)	-.06
Helo.	(10.02)	---	---	--
Jet	(11.00)	54.4 (172)	54.5 (156)	.01
Mari.	(----)	---	---	--
			Weighted Mean:	(.00)
ADV, Flight				
E2C2	(6.82)	50.0 (18)	47.9 (10)	-.31
Helo.	(7.30)	52.8 (323)	53.3 (180)	.07
Jet	(5.80)	55.3 (198)	55.8 (192)	.09
Mari.	(6.84)	52.7 (94)	53.3 (108)	.09
			Weighted Mean:	(.07)
ADV, Academic				
E2C2	(14.91)	48.3 (19)	45.2 (8)	-.21
Helo.	(10.20)	53.4 (321)	53.6 (178)	.02
Jet	(10.83)	56.5 (173)	57.5 (166)	.09
Mari.	(8.42)	51.0 (38)	52.2 (47)	.14
			Weighted Mean:	(.05)

Table 4.3 shows moderate sized differences in primary training, favoring SNPs with technical majors. However, once we move into intermediate and advanced flight training, any advantage that students with technical college majors had disappears. The largest differences are in intermediate flight scores, but these range from only .02 to .24 and average overall only .13. In the other three scores (Intermediate Academic, Advanced Academic, Advanced Flight) the students in the E2C2 pipeline with nontechnical majors outperform their classmates with technical majors and the students in the other pipelines do about equally well regardless of their college major.

The high performance of students with nontechnical college majors cannot be explained by saying that they have been shunted into the easier pipelines. It is true that the students from nontechnical backgrounds are more likely to wind up in the helicopter and E2C2 pipelines as a result of their lower performance in AOCS/APFI and primary training. In addition, the lowest performing students in AOCS/APFI and primary, who came disproportionately from those students with nontechnical college majors, have been attrited. For both these sets of reasons, the students with nontechnical backgrounds in any particular pipeline will not be as different from students with technical backgrounds in that pipeline as they would be if there were no attrition and if earlier performance were not a basis for pipeline assignment.

It is possible to construct mathematical models which estimate the effects of these factors. However, no plausible model we could construct to correct for these biases produces an adjusted correlation between college major and performance in intermediate and advanced flight as much as twice as large as the correlation we find in Table 4.3 -- which would still be quite small. Since the apparent effect of a college technical major is to increase one's scores by less than 1/10 of a standard deviation in intermediate and advanced training, it is clear that no possible mathematical adjustment could make the impact of college technical major as important for SNPs as it is for SNFOs. In general, the value of a technical as opposed to a nontechnical major

is three times greater for SNFOs than for SNPs; perhaps a mathematical adjustment for attrition and pipeline assignment might reduce that to a difference only twice as great for SNFOs.

A look back at Figure 4.1 indicates that a difference of less than one-tenth of a standard deviation is probably irrelevant when one is trying to decide whether to use a particular criterion as a selection device. Even increasing the difference through mathematical adjustment to .15 or .2 standard deviations would not produce a difference that would be of great importance in pilot selection.

4.2.2.2 *Student Naval Pilots*: *Attrition*

Table 4.4 shows the attrition rates for SNPs with technical and nontechnical majors. The table can be easily summarized -- there are no differences worth paying attention to. The attrition rates in AOCS and APFI are not statistically significantly higher for SNPs with nontechnical college majors. Attrition rates for SNPs with technical and nontechnical majors are identical in primary, intermediate, and advanced training.

Table 4.4

Attrition Rates for Student Naval Pilots,
with and without Undergraduate Technical Majors

(Attrition Rates)

PROGRAM COMPONENT	TECHNICAL MAJOR? NO	(n)	YES	(n)	DIFFERENCES
pre-APFI	1%	(587)	2%	(447)	+ 1%
pre-AOCS	8%	(275)	9%	(195)	+ 1%
APFI	2%	(505)	0%	(398)	- 2%
AOCS	11%	(227)	12%	(162)	+ 1%
PRIMARY	5%	(711)	5%	(561)	0
INT.					
E2C2	14%	(22)	0	(10)	-14%
Helo	0	(321)	0	(179)	0
Jet	1%	(211)	2%	(210)	+ 1%
Mari.	0	(100)	0%	(115)	0
Total, INT	1%	(654)	1%	(514)	0
ADV.					
E2C2	11%	(19)	0	(10)	-11%
Helo	2%	(321)	2%	(179)	0
Jet	4%	(208)	5%	(205)	+ 1%
Mari.	3%	(100)	1%	(115)	- 2%
Total, ADV	3%	(648)	3%	(509)	0
Total, AOCS/APFI	5%		3%		- 2%
Total PRI-ADV	9%		9%		0
Total AOCS/APFI-ADV	14%		12%		- 2%

4.2.2.3 *Interpretation*

The same selection devices are used to recruit SNFOs as are used to select SNPs, but in fact the two different fields seem to require different sets of skills. The student with a college technical background has a definite advantage as an SNFO, and the possibility is worth considering that students with technical majors should be given priority in selections for flight officer training. However, there is no evidence here that an undergraduate technical major is of great help in identifying successful SNPs. It is true that students with technical backgrounds have less trouble in AOCS/APFO classroom work and learn to fly primary trainers more easily; but after that point, the student with a background in a nontechnical field is barely distinguishable from one with a technical undergraduate major.

It is important to bear in mind that flight officer or pilot duties constitute only a portion of the demands placed on naval aviation officers. They also must perform all the leadership and decisionmaking functions required of Navy officers, and technical training may be valuable for some of those duties. Obviously, a senior officer with an undergraduate physics major may better understand policy issues having to do with some highly technical aspects of the operation of the Navy. We have no data here about actual fleet performance of officers with and without advanced or undergraduate technical training, but that does not mean that this issue can be safely ignored.

One place where this is recognized is in the designation of non-college graduates as "limited duty officers" -- recognizing that a college degree might not be important in flying, but might be very important in decision-making. It may well be that technical majors (or AQT scores) might be important for officer duties in the same way that a college degree is.

4.3 PERFORMANCE OF STUDENTS AS A FUNCTION OF THEIR AQT AND FAR SCORES

4.3.1.1 *Student Naval Flight Officers: Performance Scores*

Table 4.5 shows the performance scores of SNFOs as a function of their scores on the Aviation Qualifying Test and Flight Aptitude Battery (AQT and FAR). The data are again from the CNATRA-ATJ Tape III.

Both the AQT and FAR proved to be strong predictors of performance in NASC, as expected. On either test, SNFPs with scores below 5 make lower grades than SNFOs with scores of 5, who in turn make lower scores than SNFOs whose scores are above 5. To make comparisons easier to see, we have pooled scores of all SNFOs with 5's or below on either test and presented the (doubly standardized) difference between their scores and the scores of those who tested at 6 or better. For example, SNFOs who entered as commissioned officers directly into APFI with scores of 6 or better on the AQT made grades in APFI .76 standard deviations higher than those who came in with scores of 5 or below, while commissioned SNFOs with FAR scores of 6 or better scored .81 standard deviations higher than those with FARs of 5 or less. Because scores for attrited students (who more often have low AQT/FAR scores, as we shall see) are missing, these differences slightly understate the true predictive power of the tests.

Table 4.5
Standardized Performance Scores of Student Naval Flight Officers, by AQT/FAR Score

(Standardized Performance Scores)

PROGRAM COMPONENT		(Std. Dev.)	AQT SCORE 1-4	(n)	5	(n)	6-9	(n)	Doubly Stand. Diff. (Std. 2)	FAR SCORE 1-4	(n)	5	(n)	6-9	(n)	Doubly Stand. Diff. (Std. 2)
APFI Acad.		(9.43)	39.2	(39)	48.4	(59)	51.9	(129)	.76	41.4	(30)	44.9	(27)	50.7	(170)	.81
AOCS Acad.		(9.49)	48.0	(28)	46.6	(90)	50.2	(99)	.35	43.0	(36)	47.6	(32)	49.9	(149)	.50
BAS. Flight		(9.96)	46.3	(66)	49.3	(150)	50.7	(227)	.23	45.6	(64)	48.2	(58)	50.6	(321)	.38
BAS. Academic		(8.53)	44.1	(67)	48.3	(152)	50.4	(228)	.40	46.0	(67)	47.1	(59)	49.6	(321)	.36
INT. Flight		(9.11)	44.9	(41)	46.5	(101)	49.5	(159)	.48	43.7	(31)	44.8	(38)	49.0	(232)	.53
INT Academic		(8.48)	44.5	(41)	48.5	(103)	50.6	(161)	.38	45.7	(30)	46.4	(39)	49.9	(236)	.46
ADV. Flight																
	ATDS	(2.86)	48.5	(6)	47.9	(12)	48.4	(19)	.05	48.0	(5)	48.1	(7)	48.3	(25)	.09
	OJN	(7.50)	51.9	(9)	50.6	(24)	51.8	(36)	.11	49.6	(11)	52.7	(3)	51.7	(55)	.19
	RIO	(9.54)	50.6	(12)	52.7	(25)	54.0	(31)	.20	44.0	(6)	48.8	(12)	55.0	(50)	.82
	TN	(9.68)	53.0	(9)	51.5	(35)	52.6	(67)	.08	49.0	(5)	48.0	(13)	53.1	(93)	.49
							Wtd. Mean:		(.11)					Wtd. Mean:		(.46)
ADV. Academic																
	ATDS	(6.53)	64.8	(6)	72.1	(12)	70.0	(19)	.05	70.2	(5)	71.3	(7)	69.4	(25)	-.22
	OJN	(9.61)	45.8	(9)	49.3	(23)	51.2	(36)	.20	42.7	(10)	49.0	(3)	51.2	(55)	.73
	RIO	(8.70)	48.2	(12)	48.1	(9)	52.8	(31)	.54	47.2	(6)	46.7	(12)	51.5	(50)	.53
	TN	(11.01)	46.1	(9)	51.4	(35)	51.6	(67)	.19	47.6	(5)	47.0	(13)	51.8	(93)	.42
							Wtd. Mean:		(.25)					Wtd. Mean:		(.44)
ADV. Simulation																
	ATDS	(6.55)	49.2	(6)	45.1	(12)	47.6	(19)	.17	44.8	(5)	50.9	(7)	46.4	(25)	-.30
	OJN	(11.70)	48.8	(9)	51.8	(24)	52.0	(36)	.09	50.2	(11)	55.7	(3)	51.5	(55)	.01
	RIO	(9.05)	53.0	(12)	51.5	(25)	54.6	(31)	.29	48.7	(6)	48.3	(12)	54.9	(50)	.72
	TN	(11.54)	53.8	(9)	51.4	(36)	53.8	(66)	.16	52.6	(5)	53.5	(13)	53.0	(93)	-.02
							Wtd. Mean:		(.17)					Wtd. Mean:		(.12)

Note: No data for students who attrited from AOCS/APFI.

To be a valuable selection device, these tests must predict performance in flight training as well as in NASC and, in the case of SNFOs, they do so. The AQT not only predicts performance in NASC. It also predicts performance in primary and intermediate stages of flight training almost as well as the FAR does. In advanced training, the tests do not predict performance in simulator training very well, but they do predict performance in both the academic and flight aspects of advanced training. In advanced training, the FAR is a stronger predictor than the AQT, with differences slightly above .4 on both academic and flight work; by contrast, SNFOs with scores over 6 on the AQT have average differences of .11 or higher on advanced flight and .25 higher in advanced academic scores.

4.3.1.2 *Student Naval Flight Officers: Flight Training Attrition*

Table 4.6 shows the flight training attrition rate for SNFOs with different AQT and FAR scores. (Pre-entrance and NASC attrition rates could not be estimated for this analysis.) The difference in attrition rates between SNFOs with high AQT or FAR scores (6+) and those with low scores (5 or less) is 7% and 8%, which are large differences; attrition rates are especially high for SNFOs with AQT or FAR scores below 5. Combining the attrition rates from all phases of flight training, we see that SNFOs with AQT or FAR scores below 5 have considerably higher attrition rates than do SNFOs with scores of 5 or higher.

Table 4.6

Flight Training Attrition Rates for Student Naval Flight Officers, by AQT/FAR Scores

(Attrition Rates)

PROGRAM COMPONENT	AQT SCORES 1-4	(n)	5	(n)	6-9	(n)	diff.	FAR SCORES 1-4	(n)	5	(n)	6-9	(n)	diff.
Pre-AOCS			No Data							No Data				
Pre-APPI			"		"					"		"		
AOCS			"		"					"		"		
APPI			"		"					"		"		
Basic	18%	(67)	5%	(134)	4%	(229)	- 5%	13%	(67)	10%	(58)	5%	(325)	- 7%
Intermediate	2%	(55)	1%	(146)	2%	(219)	+ 1%	3%	(58)	2%	(52)	1%	(310)	- 2%
Advanced - ATDS	0	(6)	0	(12)	3%	(19)	+ 5%	0	(5)	0	(6)	4%	(26)	+ 4%
OJN	11%	(9)	4%	(25)	3%	(37)	- 3%	0	(11)	0	(3)	5%	(57)	+ 5%
RIO	8%	(13)	7%	(27)	3%	(32)	- 4%	25%	(8)	0	(12)	4%	(52)	- 6%
TN	0	(12)	7%	(42)	2%	(55)	- 4%	8%	(25)	0	(13)	3%	(71)	- 2%
Total, Advanced	5%	(40)	6%	(106)	3%	(143)	- 3%	8%	(49)	0	(34)	4%	(206)	- 1%
Total, Bas-Adv	24%		12%		9%		- 7%	22%		12%		10%		- 8%

4.3.2.1 *Student Naval Pilots: Performance Scores*

Table 4.7 shows the pattern for students in the pilot training program. The AQT and FAR do not predict performance as well for SNPs as for SNFOs, a pattern similar to what we saw for a technical college major. The AQT predicts scores in NASC and in the academic part of primary training. It also predicts moderately well scores in the academic component of advanced training. However, it is a poor predictor of flight performance in nearly all stages of the program. SNPs with high AQT scores (6+) scored .04, .18 and .13 standard deviations higher than SNPs with lower scores (5 or less) in their flight performance in primary, intermediate and advanced. The FAR is a better predictor of flight performance, especially in primary, but its predictive powers are not very strong in intermediate and advanced flight. In intermediate flight, SNPs with high FAR scores score about a quarter of a standard deviation higher than those with low FAR scores, but in advanced they score only about a sixth of a standard deviation higher.

Table 4.7
Standardized Performance Scores of Student Naval Pilots, by AQT/FAR Score

(Standardized Performance Scores)

PROGRAM COMPONENT		(Std. Dev.)	AQT SCORE 1-4	(n)	5	(n)	6-9	(n)	Doubly Stand. Diff.	FAR SCORE 1-4	(n)	5	(n)	6-9	(n)	Doubly Stand. Diff.
APFI Academic		(8.71)	45.4	(213)	49.2	(262)	53.4	(411)	.68	47.1	(41)	47.2	(131)	51.0	(715)	.44
AOCS Academic		(8.30)	49.4	(84)	51.5	(123)	54.0	(114)	.41	44.5	(4)	48.1	(50)	52.6	(267)	.57
PRI Flight		(9.30)	52.4	(309)	52.6	(404)	52.9	(544)	.04	47.0	(48)	49.7	(187)	53.5	(1023)	.47
Academic		(14.03)	48.0	(248)	51.6	(325)	56.2	(436)	.44	47.3	(36)	49.7	(154)	53.5	(820)	.31
INT. Flight																
	E2C2	(5.50)	51.3	(9)	50.0	(11)	52.0	(17)	.25	---		50.3	(6)	51.4	(28)	.20
	Helo	(6.30)	53.4	(134)	54.1	(174)	55.8	(261)	.32	51.7	(26)	54.0	(94)	55.0	(409)	.24
	Jet	(7.43)	51.7	(94)	52.3	(137)	52.7	(209)	.08	51.2	(8)	51.2	(46)	52.5	(368)	.18
	Mari.	(6.72)	57.2	(51)	57.2	(66)	57.5	(107)	.04	58.8	(12)	55.9	(27)	57.5	(175)	.37
								Wtd. Mean:	(.18)						Wtd. Mean:	(.24)
INT. Academic																
	E2C2	(11.63)	53.1	(7)	47.6	(10)	53.4	(12)	.30	---		40.0	(5)	53.7	(24)	1.18
	Helo	(10.02)	---		---		---			---		---		57.3	(3)	
	Jet	(11.00)	50.6	(81)	52.4	(112)	55.4	(150)	.35	55.0	(8)	51.1	(40)	53.6	(296)	.17
	Mari.	(---)	---		---		---			---		---		---		
								Wtd. Mean:	(.35)						Wtd. Mean:	(.25)
ADV. Flight																
	E2C2	(6.82)	49.7	(7)	48.0	(11)	49.0	(13)	.05	---		45.8	(6)	49.5	(25)	.54
	Helo	(7.30)	52.7	(133)	51.9	(174)	53.7	(221)	.20	49.6	(26)	52.1	(94)	53.2	(408)	.20
	Jet	(5.80)	55.1	(91)	55.4	(133)	55.8	(183)	.09	56.6	(7)	54.9	(46)	55.6	(355)	.09
	Mari.	(6.84)	51.7	(51)	54.1	(65)	53.3	(97)	.04	51.8	(12)	53.3	(27)	53.2	(174)	.10
								Wtd. Mean:	(.13)						Wtd. Mean:	(.16)
ADV. Academic																
	E2C2	(14.91)	49.5	(8)	46.0	(10)	47.1	(11)	-.03	---		39.4	(5)	49.0	(24)	.67
	Helo	(10.20)	50.1	(133)	52.9	(170)	56.4	(220)	.46	50.5	(26)	52.7	(94)	54.1	(403)	.12
	Jet	(10.83)	54.8	(81)	56.0	(121)	58.8	(150)	.31	57.0	(8)	56.6	(42)	57.0	(303)	.04
	Mari.	(8.42)	50.0	(20)	51.5	(24)	53.0	(45)	.26	51.8	(5)	53.1	(12)	51.8	(72)	.11
								Wtd. Mean:	(.17)						Wtd. Mean:	(.09)

4.3.2.2 *Student Pilots: Flight Training Attrition*

Flight training attrition rates for SNPs with high and low AQT/FAR scores are presented in Table 4.8. (Pre-entrance and NASC attrition rates could not be estimated for this analysis, because CNATRA-ATJ Tape III did not uniformly include AQT and FAR scores for those who attrited prior to flight training.) Table 4.8 shows some surprising results. We saw in Table 4.7 that SNPs with low AQT or FAR scores scored slightly lower on flight scores in intermediate and advanced training. SNPs with FAR scores of 5 or lower have attrition rates only very slightly higher than those with scores of 6 or more, and for AQT scores, we see a slight tendency in the opposite direction: SNPs with lower AQT scores are actually *less* likely to be attrited. The difference is not statistically significant, but it is noteworthy, because it is consistent with the earlier finding that SNPs with non-technical undergraduate majors were not more likely to be attrited from pilot training, despite having slightly lower flight scores.

Table 4.8

Flight Training Attrition Rates for Student
Naval Pilots, by AQT/FAR Scores

(Attrition Rates)

PROGRAM COMPONENT		AQT SCORES 1-4	(n)	5	(n)	6-9	(n)	diff.	FAR SCORES 1-4	(n)	5	(n)	6-9	(n)	diff.
Pre-AOCS					No Data							No Data			
Pre-APPI					"	"						"	"		
AOCS					"	"						"	"		
APPI					"	"						"	"		
Primary		3%	(311)	2%	(411)	3%	(552)	+ 1%	2%	(49)	5%	(190)	2%	(1036)	- 2%
Intermediate,	E2C2	11%	(9)	8%	(12)	7%	(14)	- 3%	--		14%	(7)	7%	(28)	- 7%
	Jet	3%	(95)	0	(138)	3%	(189)	+ 1%	0	(8)	0	(46)	2%	(369)	+ 2%
Advanced,	E2C2	25%	(8)	0	(11)	0	(13)	-11%			0	(6)	8%	(26)	+ 8%
	Helo.	2%	(131)	2%	(174)	1%	(220)	- 1%	8%	(26)	1	(94)	1%	(405)	- 1%
	Jet	3%	(92)	3%	(137)	5%	(184)	+ 2%	0	(8)	7	(46)	4%	(360)	- 2%
	Mari.	4%	(51)	0	(66)	2%	(98)	0	0	(12)	0	(26)	2%	(177)	- 2%
Total Advanced		3%	(282)	2%	(388)	3%	(515)	0	4%	(54)	2	(172)	3%	(968)	0
Total, Pri. to Adv.		10%		5%		9%		+ 2%	6%		9%		7%		- 1%

4.3.3. *Interpretation*

In summary, these four tables make the following points.

1. SNFOs with low AQT and FAR scores have records of lower performance at all stages of the program and are less likely to complete training. However, even here, three-quarters of the SNFOs with AQT or FAR scores below 5 who enter flight training will complete it.

2. SNPs who score low on the AQT or the FAR perform less well in NASC; they have lower academic scores in primary training, and they have moderately lower academic performance scores in advanced training. However, SNPs with low AQT or FAR scores earn only slightly lower scores in flight training. In general, the AQT and FAR must be considered weak predictors of SNP training success.

3. SNPs with scores below 6 on the AQT and FAR do not stand an increased risk of attrition during flight training.<*>

Policy makers in the Navy may have difficulty drawing strong conclusions from this set of data. There is neither overwhelming evidence that the AQT/FAR is of great value nor strong evidence that it is worthless.

Some conclusions can be drawn, however. The first is that the Navy seems justified in its present policy of lowering the requirements on the AQT/FAR when a shortage of pilot candidates appears in recruiting. However, the Navy should be reluctant to encourage students with low scores to enter the SNFO pipeline.

<*>However, readers are referred to the next section of our report in which we analyze the process by which students are attrited; there we suggest that failure of the AQT/FAR to correlate with SNP attrition may be a reflection of the way attrition decisions are made, not evidence of problems with the test.

Second, there have been various discussions about using a psychomotor, non-pencil-and-paper test to supplement the AQT/FAR. Given the importance placed upon mechanical skills, eye-hand coordination, and quick reflexes in pilot training, and given our findings that the AQT/FAR are not good predictors of flight performance, a non-pencil-and-paper test -- perhaps using a computer terminal or some other mechanical equipment -- seems appropriate.

Third, we do not know enough about whether students can be coached on the FAR battery, and we do not know very much about the impact of multiple retakes of the test on performance. These issues should be studied in the future.

Fourth, we have been told that review boards when making attrition decisions often look at students' AQT/FAR scores. This is clearly a bad practice. Since these scores are not correlated so highly with flight performance, particularly for SNPs, they should not be considered as providing useful information to a review board.

We were not given access to the test items, so we have not done a detailed analysis of the content of the AQT/FAR, nor have we considered the value of different subcomponents or particular items on the battery. We have been told that some particular items on the test battery ask specific information which was timely when the test was first developed many years ago. It seems reasonable to make at least a modest investment in improving the test, and it may well be that a large scale improvement effort is justified; however, we do think there are limits to the ability of any pencil-and-paper test to predict performance in the cockpit.

We have not analyzed the degree to which the AQT or the FAR predict the non-flying performance of Naval officers. If a major investment is made to improve the AQT/FAR battery or to supplement it with additional paper-and-pencil tests, we would urge that consideration be given to developing a test which predicts performance in non-flying officer duties, particularly decision making and supervision.

4.4 PERFORMANCE RECORDS OF MINORITY STUDENT NAVAL AVIATORS

For some time the Navy has been very concerned with the high attrition rates of Black and Hispanic students in aviation training. To examine minority attrition and its causes, we conducted detailed analyses of the available data.

Tables 4.9 and 4.10 present the performance scores of Black, Hispanic, and nonminority SNFOs and SNPs and show the doubly standardized difference between minority and nonminority scores. These data are for the same group of students as were analyzed in the preceding sections -- those who made it to flight training from the cohort that entered NASC in 1983 or the first half of 1984 and consequently had time to complete the entire training process.

4.4.1 *Student Naval Flight Officers*: *Performance Scores*

Table 4.9 shows that those Black and Hispanic students had NASC scores much lower than those obtained by nonminority students: the difference between minorities (Black and Hispanic combined) and nonminorities is greater than 1 standard deviation. Since we believe that CNATRA-ATJ Tape III omits the records of some SNAs who attrited during NASC, and we presume that the minority students who attrited had even lower scores than those who survived AOCS and APFI, and since the attrition rate in NASC was much higher for Blacks and Hispanics than for nonminorities, the large difference in scores shown in Table 4.9 actually understates the actual minority/nonminority difference.

After the SNAs enter flight training, the differences in performance scores of Black and Hispanic students compared to nonminority students become smaller, although they remain large. Scores in primary, intermediate, and advanced SNFO training are typically two-thirds of a standard deviation lower than scores for non-minorities in academics, and slightly over .5 standard deviations lower for flight and advanced simulator performance.

Table 4.9

Standardized Performance Scores for Black and Hispanic Student Naval Flight Officers

(Standardized Performance Scores)

		ETHNICITY						
PROGRAM COMPONENT	(Std. Dev.)	Black	(n)	Hispanic	(n)	Non-Minority	(n)	Doubly Standardized Difference
APFI	(9.43)	41.5	(4)	39.5	(4)	49.2	(224)	.92
AOCS	(9.49)	36.6	(14)	39.3	(7)	49.6	(198)	1.28
BAS, Flight	(9.96)	43.4	(16)	47.3	(12)	50.0	(421)	.49
Academic	(8.53)	43.1	(18)	44.2	(11)	49.1	(426)	.65
INT, Flight	(9.11)	42.1	(11)	43.0	(4)	48.4	(287)	.67
Academic	(2.86)	43.1	(11)	47.0	(4)	49.4	(291)	.62
ADV, Flight								
ATDS	(2.86)	47.7	(3)	--	--	48.4	(34)	.24
OJN	(7.50)	--	--	39.0	(1)	51.9	(67)	1.72
RIO	(9.54)	48.3	(3)	--	--	53.1	(63)	.50
TN	(9.68)	46.5	(2)	45.7	(3)	53.0	(111)	.72
							Mean:	(.63)
ADV, Academic								
ATDS	(6.53)	68.7	(3)	--	--	70.4	(34)	.26
OJN	(9.61)	--	--	48.0	(1)	50.2	(66)	.23
RIO	(8.70)	40.3	(3)	--	--	50.9	(63)	1.22
TN	(11.01)	44.0	(2)	42.3	(3)	51.2	(111)	.75
							Mean:	(.70)
Adv, Simulator								
ATDS	(6.55)	46.7	(3)	--	--	47.5	(34)	.12
OJN	(11.70)	--	--	62.0	(1)	51.4	(67)	-.9
RIO	(9.05)	48.0	(3)	--	--	53.4	(63)	.60
TN	(11.54)	37.0	(2)	48.7	(3)	53.2	(11)	.80
							Mean:	(.44)

4.4.2 *Student Naval Pilots*: *Performance Scores*

Table 4.10 shows the pattern for SNPs; the ethnic differences in performance scores are smaller than for SNFOs. In NASC, minority students score .55 standard deviations below non-minorities in AFPI, and .94 standard deviations lower in AOCS. Both differences are smaller than the corresponding differences for SNFOs. We are not sure what selection criteria determine which candidates become SNFOs and which become SNPs. These data would suggest that less qualified Black and Hispanic students are shunted away from pilot training and into flight officer training. (Hispanic SNPs who graduated from NASC have higher AQT/FAR scores than Hispanic SNFOs who completed NASC, but a parallel pattern does not exist for Black SNFOs and SNPs.)

Table 4.10

Standardized Performance Scores for Black and Hispanic Student Pilots

(Standardized Performance Scores)

PROGRAM COMPONENT	(Std. Dev.)	Black	(n)	Hispanic	(n)	Non-Minority	(n)		Doubly Standardized Difference
APFI	(8.71)	45.4	(15)	45.7	(19)	50.4	(849)		.55
AOCS	(8.38)	43.2	(13)	46.3	(17)	52.8	(288)		.94
PRI, Flight	(9.30)	48.9	(28)	49.4	(38)	52.9	(1184)		.40
Academic	(14.03)	49.2	(24)	49.7	(25)	52.8	(953)		.24
INT, Flight									
E2C2	(5.50)	45.5	(2)	--	--	45.0	(31)		-.09
Helo	(6.30)	52.2	(13)	51.3	(18)	54.8	(500)		.28
Jet	(7.43)	52.5	(6)	50.9	(11)	52.4	(401)		.13
Mari.	(6.72)	52.5	(6)	54.9	(8)	57.7	(195)		.57
								Mean:	(.28)
INT, Acad									
E2C2	(11.62)	41.0	(2)	--	--	52.2	(26)		.96
Jet	(11.00)	55.8	(4)	47.0	(6)	53.5	(329)		.27
								Mean:	(.34)
ADV, Flight									
E2C2	(6.82)	45.0	(2)	--	--	49.0	(28)		.59
Helo	(7.30)	49.2	(13)	50.8	(7)	53.0	(499)		.44
Jet	(5.80)	57.4	(5)	51.9	(11)	55.6	(388)		.34
Mari.	(6.84)	59.3	(6)	55.4	(7)	53.0	(194)		-.61
								Mean:	(.19)
ADV, Acad									
E2C2	(14.91)	38.0	(2)	--	--	48.2	(26)		.68
Helo	(10.20)	43.2	(13)	49.2	(18)	53.9	(494)		.71
Jet	(10.83)	54.2	(5)	55.1	(7)	56.9	(337)		.20
Mari	(8.42)	49.0	(2)	50.0	(2)	52.2	(81)		.32
								Mean:	(.52)

Minority SNPs in flight training typically score only about a third of a standard deviation lower than non-minorities on both academic and flight work. Both sets of scores are better than the performance of minority NSFOs shown in Table 4.9.<*>

We had been told that the present policy does not assign minority candidates with low AQT/FAR scores to SNFO training. However, the large performance difference for minority SNFOs and SNPs remain to be explained. We cannot rule out the possibility that the minority students entering pilot training were academically more competent than those entering flight officer training. If so, this is unfortunate, because we have already seen that the flight officer training program is cognitively more demanding than pilot training.

4.4.3 *Attrition*

Tables 4.11 and 4.12 show that the attrition rates for Black and Hispanic SNFOs and SNPs are quite high. Over half the Black SNFOs, nearly half the Hispanic SNFOs, and three-eighths of the minority SNPs are attrited in AOCS. Of those who survive AOCS, 43% of the Black SNFOs and 31% of the Hispanics are attrited, a rate four times higher than that of nonminorities. Overall, three quarters of the Black SNFOs and over half of the Hispanic SNFOs are attrited in either NASC or flight training. Attrition rates are not as high for SNPs, but the minority-nonminority ratio is still severe, with an attrition rate in flight training which is twice as high and an overall attrition rate (including AOCS, APFI and flight training) which is over three times higher for minorities. Overall, 37% of minority SNPs attrite, compared to 11% of nonminorities.

<*> SNPs are sorted into strata by ability, with only the best students entering the jet pipeline and weaker students winding up in the helicopter and E2C2 pipelines. The impact of such sorting would be to make minority and nonminority SNPs within each pipeline more similar in prior performance, reducing the performance differences in intermediate and advanced training. However, statistically correcting for this would make only a very small change in the figures.

Table 4.11

Attrition Rates for Black and Hispanic Student Naval Flight Officers

(Attrition Rates)

PROGRAM COMPONENT	ETHNICITY Black	(n)	Hispanic	(n)	Non-Minority	(n)	Difference
APPI	20%	(5)	0	(4)	7%	(240)	- 4%
AOCS	59%	(34)	43%	(14)	20%	(253)	-34%
BAS	22%	(18)	31%	(13)	6%	(430)	-20%
INT	0	(14)	0	(9)	2%	(404)	+ 2
ADV, ATDS	0	(3)	--	--	3%	(34)	
OJN	100%	(1)	0	(1)	3%	(68)	
RIO	40%	(5)	--	(1)	3%	(65)	
TN	0	(2)	0	(3)	0	(111)	
TOTAL ADV	27	(11)	0	(4)	2%	(278)	-25%
TOTAL AOCS/APPI	54%		33%		14%		
TOTAL BAS - ADV	43%		31%		9%		
TOTAL AOCS/APPI-ADV	74%		54%		21%		

COMPARING COMBINED MINORITY ATTRITION TO NON-MINORITY ATTRITION:

AOCS/APPI	47%	14%	-33%
BAS - ADV	38%	9%	-36%
AOCS- ADV	68%	22%	-46%

Table 4.12

Attrition Rates for Black and Hispanic Student Pilots

(Attrition Rates)

PROGRAM COMPONENT	ETNICITY Black	(n)	Hispanic	(n)	Non-Minority	(n)	Difference
APFI	0	(16)	0	(21)	1%	(913)	+ 1%
AOCS	42%	(26)	33%	(27)	8%	(342)	-31%
PRI	12%	(32)	12%	(41)	4%	(1258)	- 8%
INT - E2C2	0	(2)	--	--	9%	(32)	
Helo	0	(12)	0	(17)	0	(498)	
Jet	0	(7)	0	(11)	2%	(421)	
Mari.	0	(6)	0	(8)	0	(206)	
Total INT	0	(27)	0	(36)	1%	(1157)	+ 1%
ADV - E2C2	0	(2)	--	--	7%	(29)	
Helo	0	(12)	6%	(17)	1%	(498)	
Jet	29%	(7)	9%	(11)	4%	(412)	
Mari.	0	(6)	12%	(8)	2%	(206)	
TOTAL ADV	7%	(27)	8%	(36)	3%	(1117)	- 5%
TOTAL AOCS/APFI	26%		19%		3%		
TOTAL PRI - ADV	19%		19%		8%		
TOTAL AOCS/APFI-ADV	40%		34%		11%		

COMPARING COMBINED MINORITY ATTRITION TO NON-MINORITY ATTRITION:

AOCS/APFI	22%	3%	-19%
PRI - ADV	19%	8%	-11%
AOCS- ADV	38%	11%	-26%

4.4.4 *Multivariate Analysis*

The first question to be asked is whether the low performance and high attrition of minorities can be explained by differences in background characteristics between minority and nonminority students. Black and Hispanic SNFOs have lower AQT and FAR scores, for example; is this in itself sufficient to explain their poorer performances? Tables 4.13 through 4.16 address this question.

Table 4.13 shows the results from a regression equation in which eight "risk factors" are used to predict scores and attrition rates in SNFO training up to the point of pipeline separation. The table shows the standardized regression coefficients (betas) and the overall multiple R for each regression. For example, Table 5.13 shows the data from eight separate regression equations predicting academic scores and attrition rates in AOCS/APFI and academic and flight scores and attrition rates in Primary and Intermediate NFO training.<*>

Since the attrition rates are simple yes/no dichotomies, and the attrition rate is quite low in most stages of the program, one should expect the betas and the overall multiple R to be lower in the equations in which attrition is the dependent variable.

Table 4.13
Regression of Student Naval Flight Officer Performance and Attrition through Intermediate Flight Training, by Eight Risk Factors

(Standardized Regression Coefficients
Predicting Performance Scores and Attrition Rates)

RISK FACTORS	AOCS Aca. Scores	AOCS Attr.	BASIC Fl. Scores	BASIC Aca. Scores	BASIC Attr.	INTERMEDIATE Fl. Scores	INTERMEDIATE Aca. Scores	INTERMEDIATE Attr.
AQT	.22*	---	.10*	.19*	-.05	.21*	.18*	.06
FAR	.22*	---	.09	.06	-.04	.10	.11	-.07
Tech. Major	.19*	-.01	.11	.11*	-.11*	.03	.14*	-.07
AOCS	.13*	.18*	.06	.12*	-.08	.07	.11	.06
Older	-.17*	.10	-.09	-.17*	.10	-.17*	-.09	.02
Female	-.09*	.07	.02	.02	.04	-.02	.01	-.01
Black/Hisp	-.20*	.23*	-.07	-.10*	.17*	-.07	-.08	-.04
Married	.11*	-.07	.03	.18*	-.02	.20*	.14*	-.04
Multiple R	.55	.36	.25	.35	.26	.35	.34	.15
(n)	(428)	(428)	(428)	(428)	(428)	(291)	(295)	(406)

* p<.05

Note: all dependent variables are standardized scores or attrition percentages.

The first column of Table 4.13 shows that the AQT and the FAR are the strongest predictors of scores in AOCS/APFI, but minority status is only slightly weaker. If the main reason why minority SNFOs perform badly was because of their lower AQT/FAR scores, then controlling on those two factors would markedly reduce the beta for minority status. Before the other variables are entered in this equation, the beta between minority status and standardized academic scores in AOCS/APFI is -.28; the absolute value of the beta is reduced only to -.20 when the seven other background factors, including AQT and FAR, are introduced as controls. Even more disturbing, minority status is strongly related to AOCS/APFI attrition: the beta is .23. (Since we do not have AQT/FAR scores for candidates who attrited from NASC, those two factors cannot be included in the equation.) The other important predictor besides minority status is entering without a commission, which is of course highly correlated with attrition, since attrition rates are much lower in APFI than in AOCS.

Moving across Table 4.13, we see that minority status is a significant predictor of academic scores in basic training and of the basic training attrition rate. In fact, minority status is by far the largest factor predicting attrition. The AQT test is a stronger predictor of flight and academic scores in both basic and intermediate flight training than of attrition rates; we noted this in analyzing Tables 4.5-4.8. In general, Table 4.13 indicates that among SNFOs the strong relationship between minority status and poor performance and high attrition is not explained by the introduction of the other control variables. For example, the uncontrolled beta between minority status and attrition rates for SNFO basic training is .19; controlling on AQT/FAR scores, age, sex, marital status, college major, and whether one entered with a commission or not reduces this to .17.

Table 4.14 shows the results of an analysis of the early stages of pilot training. Minority status is again a significant predictor of poor performance and high attrition when other factors are controlled. For SNPs, minority status is a much better predictor of attrition rates in primary

training than are AQT and FAR scores. In predicting attrition rate from NASC, minority status is as strong a factor as is entering without a commission. However, in AOCS/APFI academic scores and in primary flight training, being a minority is not as strong a predictor as is performance on the FAR.

Table 4.14
Regression of Student Pilot Performance and Attrition through Primary Flight Training, by Eight Risk Factors

(Standardized Regression Equations Predicting Performance Scores and Attrition Rates)

	AOCS		PRIMARY		
RISK FACTORS	Acad. Score	Attr.	Fl. Score	Acad. Score	Attr.
AQT	.29*	.03	-.04	.22*	.00
FAR	.21*	.01	.30*	.14*	-.04
Technical Major	.11*	-.02	.10*	.13*	.03
AOCS	.15*	.21*	.10*	.13*	-.01
Older	-.14*	.02	-.08*	-.03	.07*
Female	-.02	-.01	.03	-.03	.05
Black/Hispanic	-.12*	.20*	-.07*	-.04	.08*
Married	.03	.06*	.00	.03	-.02
Multiple R	.48	.33	.36	.35	.12
(n)	(992)	(1000)	(998)	(748)	(1000)

* p<.05

Note: all dependent variables are standardized scores or attrition percentages.

Table 4.15 analyzes the same data for performance scores and attrition rates in SNFO advanced training. Minority status is a strong predictor of attrition in two of the three pipelines which have any attrition at all in these data.

Table 4.15
Regression of Performance and Attrition of Student Naval Flight Officers in Advanced Flight Training, by Eight Risk Factors

(Standardized Regression Coefficients Predicting Performance Scores and Attrition Rates)

PIPELINES

	TN				OJN				RIO				ATDS			
RISK FACTORS	Fl. Scores	Aca. Scores	Sim. Scores	Attr.	Fl. Scores	Aca. Scores	Sim. Scores	Attr.	Fl. Scores	Aca. Scores	Sim. Scores	Attr.	Fl. Scores	Aca. Scores	Sim. Scores	Attr.
AQT	.10	.04	.16	--	-.03	.26*	.16	-.11	-.23	.28*	.20	-.01	-.04	.25	-.10	.07
FAR	.22*	.17	.02	--	-.01	.14	-.12	.12	.26	.15	.19	-.06	-.07	-.33	.02	-.04
Tech. Major	.17	.11	.13	--	.00	.07	.06	.08	-.05	.03	.08	-.08	.14	.35	-.01	-.18
AOCS	-.07	.16	-.03	--	.18	.23	.01	.19	-.15	-.13	-.13	-.16	.28	-.11	.55*	-.25
Older	.05	-.11	-.02	--	-.40*	-.36*	-.35*	.00	-.17	-.08	-.24	.03	-.56*	.19	-.11	-.07
Female	--	--	--	--	-.11	-.26*	.26*	-.02	--	--	--	--	--	--	--	--
Black/Hisp.	-.08	-.10	-.12	--	-.08	.18	.27*	.33*	.04	-.12	.02	.42*	-.10	.06	-.05	-.07
Married	.09	.06	.13	--	.10	.11	.13	-.10	.06	.21	.00	-.11	.15	.18	-.02	.00
Mult. R	.35	.29	.27	--	.38	.62	.47	.46	.44	.51	.46	.46	.46	.51	.51	.30
(n)	(104)	(104)	(104)		(67)	(66)	(67)	(69)	(64)	(64)	(64)	(68)	(37)	(37)	(37)	(37)

* p<.05

Note: all dependent variables are standardized scores or attrition percentages.

Table 4.16 summarizes the equations predicting SNP performance and attrition in intermediate and advanced training, and shows generally lower minority regression coefficients, with only three significant regression coefficients in the fourteen equations.

Table 4.16
Regression and Performance and Attrition of Student Pilots in Intermediate and Advanced Flight Training, by Eight Risk Factors

(Standardized Regression Coefficients Predicting Performance Scores and Attrition Rates)

	HELO				JET						MARITIME			
	Inter.	Adv.			Inter.			Adv.			Inter.	Adv.		
RISK FACTORS	Fl. Score	Fl. Score	Aca. Score	Attr.	Fl. Score	Aca. Score	Attr.	Fl. Score	Aca. Score	Attr.	Fl. Score	Fl. Score	Aca. Score	Attr.
AQT	.10*	.00	.24*	-.03	.04	.20*	-.01	.06	.16	.07	.02	.05	.24*	-.06
FAR	.16*	.17*	.05	-.05	.13	.09	.11	.10	.01	-.11	.08	.21*	.05	.04
Technical Major	.01	.00	-.04	.02	.01	.06	.00	.01	.02	.05	.09	.00	.12	-.10
AOCS	-.04	-.03	-.02	.02	.01	.03	.01	.04	-.02	-.08	.06	-.03	.18	-.13
Older	-.15*	-.17*	.02	.02	-.07	-.09	.04	-.14	-.02	.15*	-.14	-.11	-.05	.00
Female	.03	.05	-.04	-.02	-.02	-.05	-.01	-.04	-.01	.07	.04	-.04	-.21	.00
Black/Hispanic	-.07	-.06	-.13*	.02	-.02	-.04	-.04	-.06	-.03	.13*	-.10	.20*	-.02	.11
Married	.08	.06	.04	-.08	.19*	.27*	-.09	.18*	.01	-.11	.15*	.00	.22	-.01
Multiple R	.29	.25	.30	.10	.23	.35	.15	.23	.17	.25	.26	.30	.39	.19
(n)	(460)	(460)	(460)	(460)	(236)	(158)	(237)	(226)	(168)	(237)	(202)	(202)	(202)	(202)

* p<.05

Note: all dependent variables are standardized scores or attrition percentages.

4.4.5 *Interpreting the Data on Minority Attrition*

When the analyses presented in Tables 4.13-4.16 were presented in a series of briefings, a number of naval aviation officials present expressed concern that we had been unable to explain the high attrition rate and poor performance of minority students. Showing that their attrition could not be attributed to low AQT/FAR scores is a first step, but to say that a factor does not explain minority attrition is of course not as helpful as identifying factors which do explain it. After hearing this criticism, we undertook an extensive new statistical analysis of the data in an effort to produce an explanation. The next several tables show the results of that analysis.

Our first task was to draw as much information as possible from Tables 4.13-4.16. These four tables report data from 84 equations -- far too many to be easily scanned. We constructed Table 4.17 to summarize the role of minority status in these equations, and uncovered two important points. First, the table shows that the standardized regression coefficient for minority status is more likely to be high when the dependent variable is attrition rather than an academic or flight score. Of the thirty equations in which academic, flight, or simulator scores are the dependent variables, only once is the minority beta greater than .2, only five times is it significant in the predicted direction, and there is no equation in which minority status is the largest predictor. In contrast, the twelve equations in which attrition rates are the dependent variables show the beta for minority status to be in excess of .2 four times; over half the equations (seven) show the minority coefficient to be statistically significant, and four times it is the largest coefficient in the equation. Thus our first conclusion: *minority status is more strongly related to attrition than it is to performance scores.*

Table 4.17

Summary of Tables 4.13-4.16

(Number of Equations)

	SCORE		ATTRITION		AOCS/APFI		SNFO		SNP	
Total Equations	30		12		4		17		21	
Minority Coefficient is...										
.20 or greater	1	(3%)	4	(33%)	3	(75%)	2	(12%)	0	
.10 - .19	8	(27%)	3	(25%)	1	(25%)	6	(35%)	4	(19%)
Sig., in predicted direction	5	(17%)	7	(58%)	4	(100%)	4	(24%)	4	(19%)
Sig., in opposite direction	2	(7%)	0		0		1	(6%)	1	(5%)
Largest cooeficient	0		4	(33%)	1	(25%)	3	(18%)	0	
Second largest	3	(10%)	3	(25%)	1	(25%)	0		5	(24%)

The right hand side of Table 4.17 shows another interesting pattern: the regression coefficients for minority status are strongest in AOCS/APFI, weakest for SNPs, and in-between for SNFOs. In AOCS/APFI, three of the four regression coefficients are greater than .2. This is true for only two out of seventeen of the SNFO equations and for none of the SNP equations. In AOCS/APFI, all four regression coefficients (100%) are greater than than .1; for SNFOs, eight out of 17 (47%) are greater than .1; but for SNPs, only four out of 21 (19%) are greater than .1. Thus our second conclusion: *minority status is a very important factor in explaining performance and attrition in NASC, is an important factor in explaining performance and attrition in the SNFO program, and is less important in the SNP program.*

4.4.6 *A Path Analytic Model*

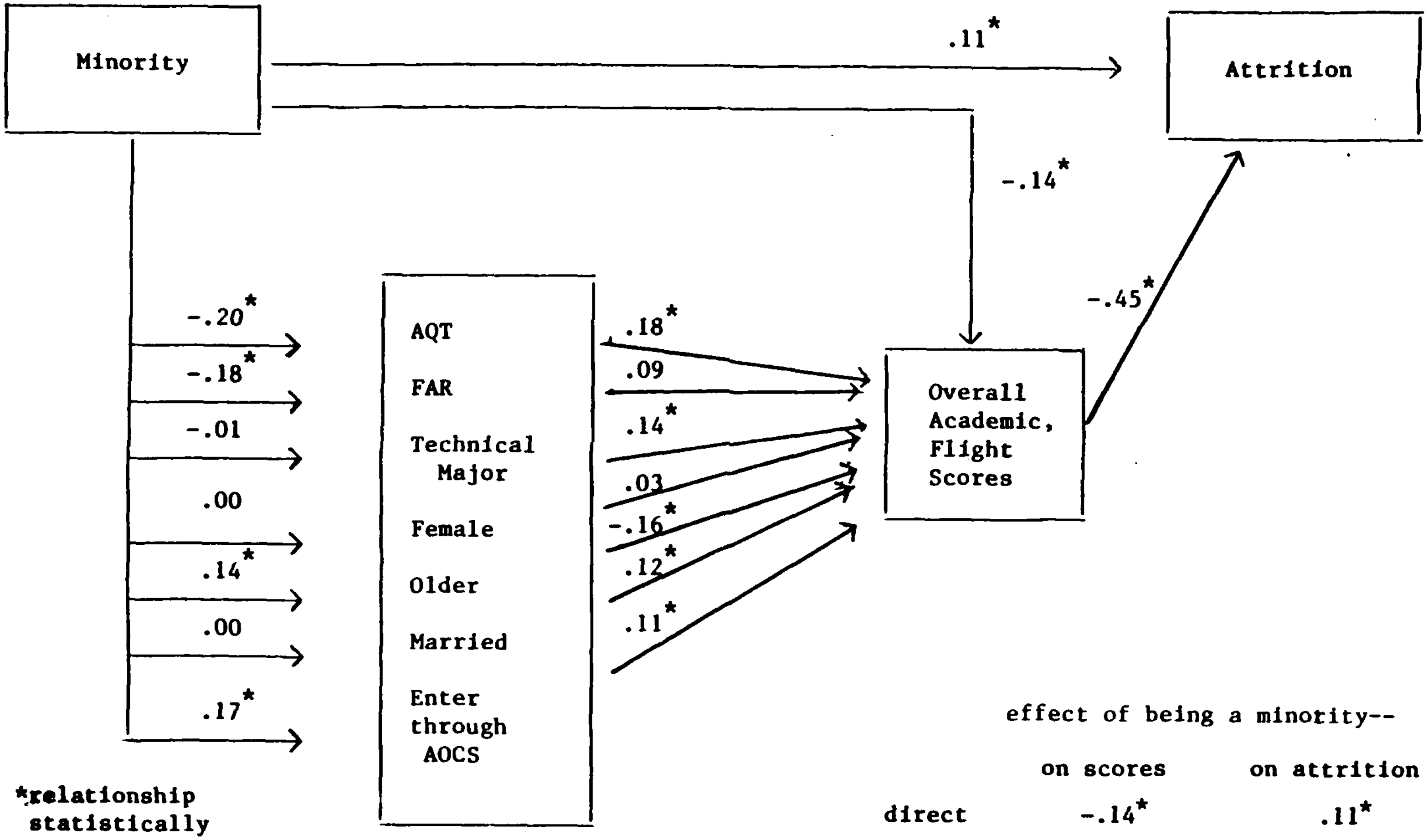
Figures 4.2 and 4.3 use the technique of "path analysis" to display the effect of minority status and the other background characteristics on both grades and attrition, first for SNFOs and then for SNPs. To compute these equations we constructed a single overall summary measure of grades earned in all stages of flight training, weighting flight grades heavily because they were most highly correlated with attrition. We also gave heavier weight to the grades earned in basic/primary training because attrition was higher there. We then constructed an overall measure summarizing the probability of attriting in all stages of flight training.

A "path" model displays the pattern of relationships in an order of causation, representing each statistically significant regression coefficient with an arrow leading from cause to effect. In this model we assume that grades are an "intervening variable" -- that is, grades are caused by background factors such as AQT/FAR scores, but grades also cause attrition.<*> One of the values of path analysis is that it allows one to distinguish cases where a variable has its effect *indirectly*, by influencing an intervening variable which in turn affects the real outcome, from

----

<*>There is an extensive statistical literature on path analysis. See, for example, Blalock, 1961; Duncan, 1966; Heis, 1969; Alwin & Hauser, 1975.

cases where the variable in question has a *direct* effect on the outcome.

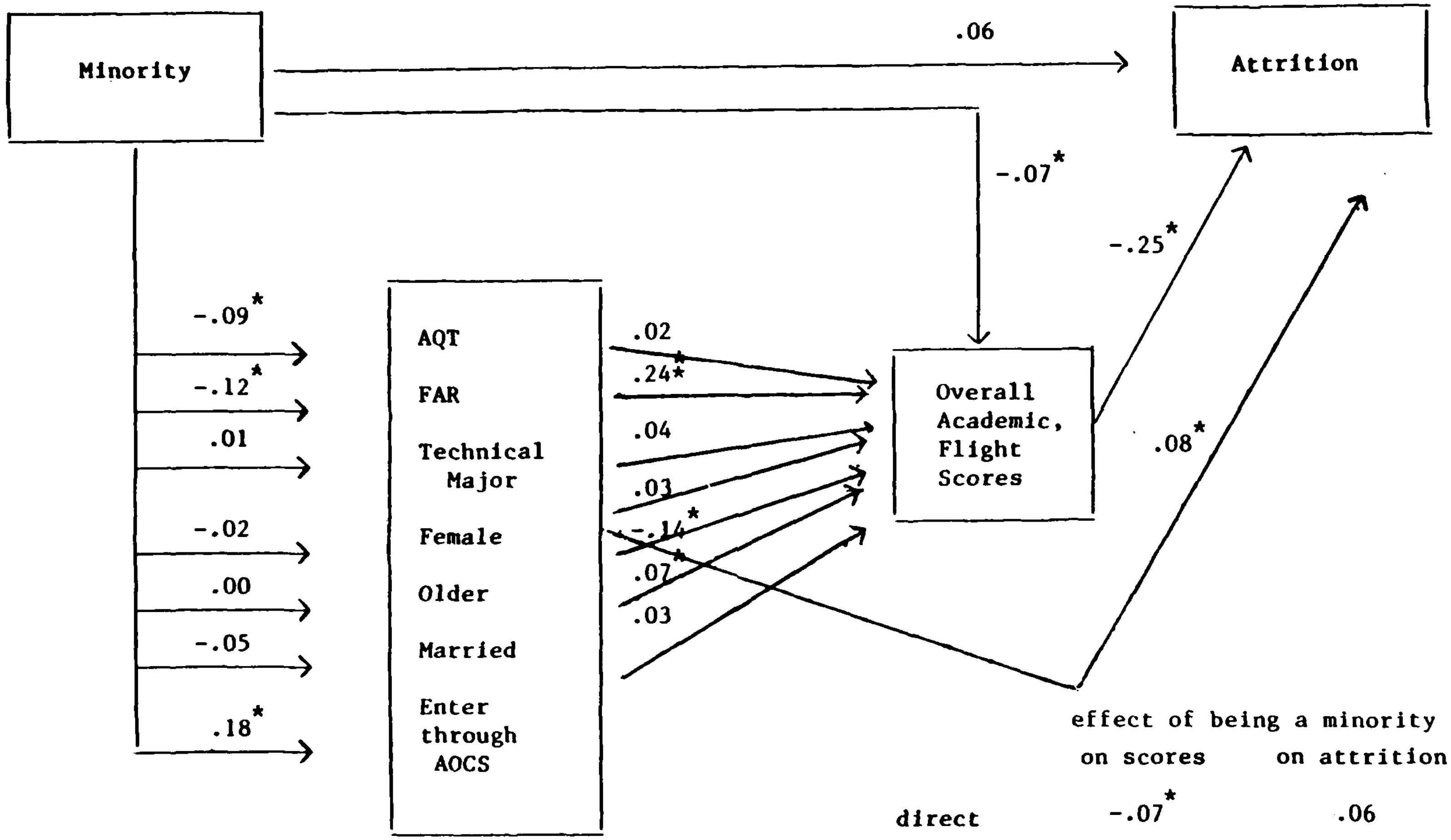


*relationship statistically significant (p<.05)

effect of being a minority--

	on scores	on attrition
direct	-.14*	.11*
indirect	-.06	.09
Total	-.20*	.20*

FIGURE 4.2 Causal Path Model of Minority Status and Other Background Factors in Explaining Attrition in Student Naval Flight Officer Flight Training



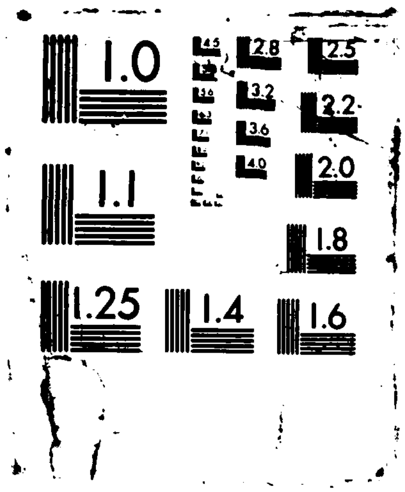
	effect of being a minority on scores	effect of being a minority on attrition
direct	-.07*	.06
indirect	-.03	.02
Total	-.10*	.08*

*relationship statistically significant ($p < .05$)

FIGURE ... Causal Path Model of Minority Status and Other Background Factors in Explaining Attrition in Student Naval Pilot Flight Training

AD-A193 373 ENHANCING PRODUCTIVITY IN NAVAL AVIATION TRAINING IN A MARKET OF CHANGING..(U) JOHNS HOPKINS UNIV BALTIMORE MD CENTER FOR SOCIAL ORGANIZATIO.. J H BRADDOCK ET AL. 2/4

UNCLASSIFIED 01 MAR 88 TR-ONR-1 N00014-85-K-0780 F/G 5/9 NL


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5

4.4.6.1 *Student Naval Flight Officers*

Figure 4.2 shows the results for SNFOs. Each arrow represents a path coefficient, showing the direct effect of one factor on another either as a correlation coefficient (if there is a double-headed arrow indicating that no causal direction is assumed), or as a standardized regression coefficient (if the arrow indicates a causal direction by having one arrowhead only). First, on the far left, we see that minority status is strongly correlated with both AQT and FAR performance, and is also related to entering naval aviation training via AOCS and being older. Three of the factors related to minority status are detrimental to minorities -- being older, and having lower AQT scores, and having lower FAR scores. Once the SNFO enters flight training, however, entering via the AOCS route is actually an advantage, because AOCS graduates are more likely to complete the program than are SNFOs who come in with their commission in hand.

These factors are in turn related to grades, as shown by the series of arrows in the center of the drawing. The strongest predictors of grades are AQT scores, which are most strongly related to overall grades, and age, with older SNFOs earning lower grades. Minority status has a significant direct coefficient of -.14, not quite as strong as AQT scores or age but as strong (in the opposite direction) as having an undergraduate technical major. Each of these paths represents the direct effect of one of these factors when the other factors are held constant. One important conclusion is that for SNFOs, minority status is significantly related to grades even when college major, AQT/FAR scores, and other factors are controlled.

On the right side of the figure, we see that overall grades are strongly related to the probability of attriting, as one might expect. But we also see that minority status remains significantly related to attrition even after grades earned are controlled. There are no arrows directly connecting any other risk factors to attrition because none of the other factors are significantly related to attrition once grades are controlled -- all the other factors have indirect effects only.

Minority SNFOs are disadvantaged because of their low AQT/FAR scores and their greater age and because they enter through AOCS. However, even when these factors are taken into account, minority status has a direct impact in producing lower grades. And even when this is allowed for, minority status has a direct impact upon attrition.

The overall pattern is summarized in the lower part of the figure, which decomposes the overall correlation between minority status and grades (-.20) into two components, the direct effect of minority status (-.14) and the indirect effect of poor AQT/FAR scores, being older, and being more likely to enter through AOCS (-.06). The lower part of the figure also shows the decomposition of the correlation of minority status with attrition, which is also -.20, into an indirect effect of -.09 (the result of the fact that minority SNFOs have lower grades) and a larger direct effect (-.11) showing that minority SNOFs are more likely to be attrited even when grades are held constant.

4.4.6.2 *Student Naval Pilots*

Figure 4.3 shows the same type of path analysis model for performance of SNPs. Minority status is again related to low scores on the AQT and FAR and is related to a higher probability of entering aviation training via AOCS, but minority status is not correlated with age. Minority students are significantly less likely to be married.

The correlations of minority status with background factors are generally weaker, and the overall small effect of minority status on grades (-.10) decomposes into a very small indirect effect of -.03 and a direct effect of -.07. We again see a significant direct effect of minority status producing lower grades which cannot be explained by other factors.

We also see a significant direct effect of minority status on attrition rates which, although small, is noticeably larger than the very small indirect effect of minority status operating through grades.

In the SNP path analysis, only one factor other than minority status is directly linked to attrition independent of the scores the SNPs earned in the program -- being female. Women SNPs are much more likely to attrite than men even when actual performance scores are controlled.

Only a small part of the high attrition rate of minority SNPs is attributable to the fact that they make lower grades and only a small part of the lower grades that they make is attributable to the fact that they have lower AQT/FAR scores. Part of the reason for these small relationships is that grades are only moderately correlated with attrition. The correlation for SNFOs was only -.45, not as high as one would expect under the natural assumption that the main reason why a student would attrite would be because of poor grades. The correlation is even lower for SNPs partly because of the way in which SNPs are selected into pipelines. Scores in the jet pipeline are generally considerably higher than scores in the helicopter pipeline, but the strike pipeline has the highest attrition rate. We do not know why the standardized scores are higher in the jet pipeline. We did not examine the standardization formulas used nor the sources they are derived from.

The sorting of SNPs into more and less selective pipelines is not the major reason why correlations are lower for SNPs. It is simply the case that the relationship between the flight scores one earns and whether one is attrited is not as strong for these candidates. We will analyze this issue further in Table 4.19.

4.4.7 *Effects of Community and Commissioning Source on Minority Attrition*

Table 4.18 presents data on the relationship of community and commissioning source on minority attrition, and makes an important point. Minorities enter aviation training in the riskiest manner and are placed into the riskier community.

The upper part of Table 4.18 shows the percentage of minority and nonminority SNFOs and SNPs entering through AOCS and APFI, and reports the attrition rate for each combination. These figures show that the lowest attrition rate is for SNPs who enter with their commission in hand, either from the U.S. Naval Academy, the U.S. Marine Officer Candidate School, ROTC or some other manner. Over half of all nonminorities enter in this manner, and only 1% are attrited. Minorities who enter in this fashion also have a very low attrition rate (in these data, 0), but only 25% of all minorities come into this program in this manner.

Table 4.18

Impact of Community/Entry Port on Minority Attrition in AOCS/APFI

(Percentages)

	Non-Minorities		Minorities	
COMMUNITY/ENTRY PORT	% this route	% Attrition	% this route	% Attrition
SNFO, non-comm	14%	20%	33%	54%
SNP, non-comm	20%	8%	36%	38%
SNFO, comm	14%	7%	6%	11%
SNP, comm	52%	1%	25%	0%

Overall non-minority attrition	6.0%
Expected non-minority attrition if numbers in each community/entry port same as minorities	10.2%
Expected minority attrition if distribution of minorities into each community/entry port was same as for non-minorities	16.7%
Overall minority attrition	32 %

The highest attrition rate for both minority and nonminority candidates is for those who enter AOCS destined to become SNFOs. The attrition rate for nonminority SNFOs entering through AOCS is 20%, but only 14% nonminorities enter in this fashion. For minorities, the attrition rate for SNFOs entering through AOCS is a much higher 54%, but, more importantly, over twice as many minorities enter in this fashion: Fully 33% of all minority candidates enter as SNFOs by way of AOCS.

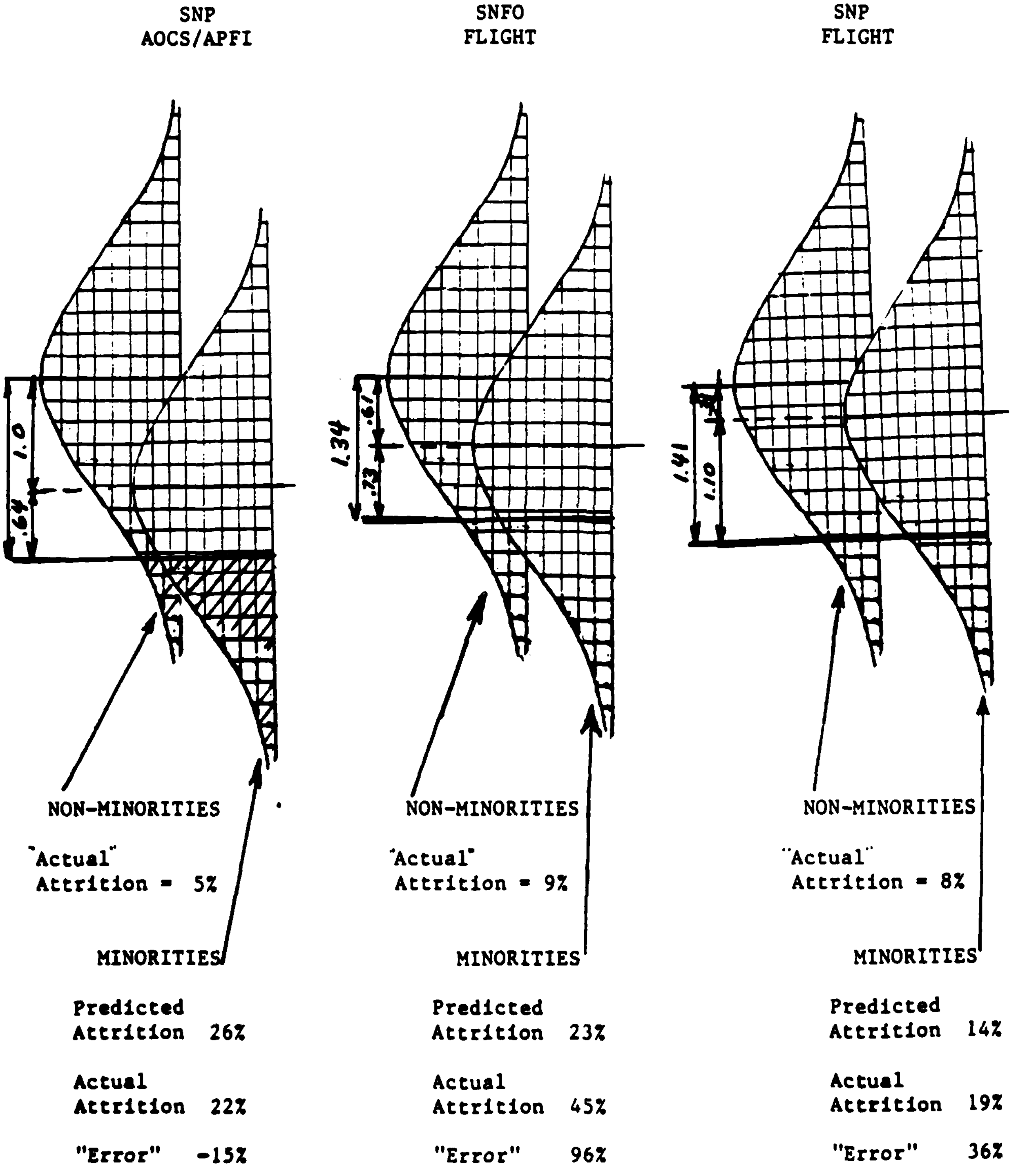
The lower part of the Table 4.18 provides calculations of how the distribution of students affects the attrition rate. The first row of this section notes that the overall nonminority attrition rate is 6%. Calculations in the second row show that if nonminorities kept their same attrition rates within each community and point of entry but were distributed as minorities are -- more often entering through AOCS and more often becoming SNFOs, the nonminority attrition rate would nearly double, becoming 10.2%. The actual minority attrition rate is 32% (as shown in the last row), but calculations presented in the third row show that if minorities were distributed as nonminorities -- more often entering with commission in hand and becoming SNPs -- their attrition rate would be reduced to 16.7%. There are compounding problems here: a high minority attrition rate within each community and entry port, coupled with a routing of minorities into the particular community and entry port that have the highest expected attrition rate.

4.4.8 *The Relationship between Minority Scores and Attrition Rates*

We noted in previous analyses that the difference in level of performance of minorities and nonminorities is greatest for attrition rates and not as great for scores earned in each stage of the program. Making the reasonable assumption that SNAs are attrited because of poor performance, which is reflected in poor scores, the difference between minority and nonminority attrition rates (in Tables 4.11 and 4.12) should be explainable by the difference between minority and nonminority scores (shown in Tables 4.9 and 4.10), The analysis shown in Figure 4.4 examines this hypothesis.

Figure 4.4

A Comparison of Actual
Attrition Rates of Minority Students
to Rates Predicted from their Scores



In Figure 4.4 we have performed three analyses of attrition, examining: NASC attrition for SNPs; attrition during flight training for SNFOs, and attrition during flight training for SNPs. (We do not analyze NASC attrition for SNFOs because this group shows particularly high NASC attrition due to drops on request by those disappointed by their inability to obtain a place in the pilot training program.)

In Figure 4.4 we have assumed that the scores are normally distributed and have plotted the distribution of scores of minority and nonminority SNAs. If normality and equal standard deviations for minority and nonminority groups are assumed, and if it is further assumed that the SNAs with the lowest scores are the ones who should be attrited, at each stage more minorities should attrite because their scores are lower. For example, in NASC, approximately 5% of nonminority SNPs would attrite, assuming that they were distributed between AOCS and APFI in the same way that minorities were. If we assume that the SNPs with the lowest scores are attrited, in order to attrite 5% of nonminorities, we would need to attrite everyone whose score was 1.64 standard deviations below the nonminority mean. The minority SNPs in these data score .9 standard deviations below the mean; it is reasonable to assume that the mean scores of all minority SNPs, including NASC attrites missing from this data file, would fall about 1.0 standard deviations below the mean score of all nonminority SNPs. If their scores are normally distributed with the same standard deviation, we would expect about 26% of all minority SNPs to have scores falling more than 1.64 standard deviations below the nonminority mean.<*> This is in fact fairly close to the actual minority attrition rate of 22%. Figure 4.4 summarizes this by showing the "error" (the difference between predicted attrition rate and actual attrition rate) to be 15% of the predicted attrition rate. This indicates that the attrition rate for minority SNPs during NASC can be predicted reasonably well by their academic grades.

<*>In a normal distribution, 5% of the cases fall more than 1.64 standard deviations below the mean, and 26% of the cases fall more than .64 standard deviations below the mean (1.64-1.00=.64).

The pattern is different in flight training, especially for SNFOs. When we pool scores across primary, intermediate and advanced training, the flight and academic scores earned by minority SNFOs (including attrites) are .61 standard deviations below the scores earned by nonminorities. Nonminority SNFOs have an attrition rate of 9%; thus if scores were rigorously used to decide on attrition, every nonminority SNFO with a score greater than 1.34 standard deviations below the mean would be attrited. If this rule were applied, about 23% of all minority SNFOs would have scores that fall this low, assuming normal distributions and the same standard deviations for minorities and nonminorities. In fact, the actual minority SNFO attrition rate during flight training is twice this high (45%). This suggests that the process by which an attrition decision is made during SNFO flight training is one in which minorities fare worse than they do in the process which awards them their flight training grades.

The far right side of Figure 4.4 shows the same calculations for SNP flight training. Among SNPs, minorities score only .31 standard deviations below nonminorities, and the nonminority attrition rate is 8%. Following the same assumptions made earlier, every SNP whose standard flight and academic scores fell 1.41 standard deviations below the nonminority mean should be attrited. Fourteen percent of minority SNPs would have scores that fall that low, and the actual minority attrition rate is 19%. The process by which SNP flight training attrition decisions are made is also a process in which minorities fare somewhat worse than they do in the process by which scores are awarded, but this discrepancy is not as great for SNPs as it is for SNFOs.

The difference between minority performance on standardized flight grades and their rate of attrition is considerable. The analysis in Figure 4.4 suggests that if grades were used rigidly as the only attrition criterion, one-third of all minority attrites would remain in training and graduate.

Table 4.19 shows more detailed analysis of one part of the data summarized in Figure 4.4 -- the attrition of minority and nonminority SNFOs and SNPs during basic/primary training as a

function of their flight scores. The upper part of the table contains the data for SNFOs. There were a total of 4 + 4 = 8 minority SNFOs and 50 + 12 = 62 nonminority SNFOs who earned average flight scores in primary training of 37 or lower. Of these, one half of the minority SFNOs attrited, but only 19% of the nonminorities did. The same pattern appears in the second line of the table--the SNFOs who had scores ranging from 38 to 47 in primary flight were attrited at a 14% rate for Blacks and Hispanics and a 5% rate for nonminorities.

The same pattern appears but not quite as strongly for the SNPs in the lower part of the table: four of the ten minority SNPs with scores under 37 attrited, compared to only 23% of the nonminority SNPs with the same scores, and the attrition rate for minority SNPs with scores from 38 to 47 was 4%, twice as high as the attrition rate for nonminority SNPs. <*>.

We do not assume that decisions to attrite students are or should be based exclusively on flight scores. Presumably the flight score may not accurately represent precisely what the candidate did to obtain a down. The review board is instructed to take subtle issues of motivation into account and try to make a sophisticated judgment about the student's ability to correct his or her problems.

<*> Minorities with with high basic/primary flight training scores, whether SNFOs or SNPs, were never attrited, although a small number of nonminorities with high scores were dropped from the program. The high scoring nonminority attrites may be voluntary withdrawals, but it is our impression that voluntary withdrawals are quite rare in the primary program.

Table 4.19
Attrition Rates in Primary/Basic Flight Training
by Flight Scores and Minority Status

(Number of Individuals, Attrition Rate)

COMMUNITY, FLIGHT SCORES	Black or Hispanic Attrition Total No.	Attr.	% Attr.	Nonminority Attrition Total No.	Attr.	% Attr.
SNFO						
up to 37	8	4	50%	62	12	19%
38 - 47	7	1	14%	144	7	5%
48 - 57	11	0	0%	125	4	3%
58 +	2	0	0%	99	0	0%
Total	28	5	18%	430	23	5%
SNP						
30 - 37	10	4	40%	48	11	23%
38 - 47	24	1	4%	388	8	2%
48 - 57	24	0	0%	486	2	0%
58 +	8	0	0%	286	2	1%
Total	66	5	8%	1209	23	2%

4.4.9 *Awarding Downs and Holding Review Boards*

Only two reasonable explanations exist for the patterns shown in Figure 4.4 and Table 4.19. Either minority candidates consistently show some pattern of behavior which indicates to instructors and review boards their inability to perform as naval aviators, or the processes of awarding downs, scheduling review boards and making attrition decisions all operate with a bias against minority candidates.

In interviews that we conducted with minority and nonminority SNAs and minority and nonminority fleet officers and instructors, a very large number of minority SNAs expressed a belief that they were victims of racial prejudice. Also a very large number of minority fleet officers believed that they had been victims of prejudice when they were going through the training program. However, almost none of the nonminority SNAs, instructors, or fleet aviators were aware of any racial bias. Because racial bias can be a convenient excuse for poor performance by minorities, complaints about prejudice must be taken with caution. On the other hand, it is difficult to completely dismiss frequently occurring complaints, especially when the fleet officers who noted the existence of bias in aviation training generally did not think they experienced much bias in their situation in the fleet.

In interviewing instructors, we were struck by the subjectivity involved in the decision to award downs and in the review board's attrition decisions. In one advanced squadron, it was assumed that all candidates had the ability to learn what they needed to know to be a successful aviator, and the instructor's job was to get them through the process rather than to judge them. In this situation, we heard instructors justify their decision not to give a down to a student by saying "the important thing was that what he did was not unsafe." In another squadron, however, we concluded from our interviews that, indeed, "the mission was attrition" as the students complained it was. There we heard very different phrases. Instructors complained frequently about the review boards not attriting students after they had given downs, and some said that

they would like to fail as many as half the students in the program. Considering these widely different attitudes and judgments, it is no surprise that attrition rates vary sharply from one squadron to another -- and this variation raises the question: how accurate are the judgments made by instructors and by review boards?

4.4.9.1 *The Reliability of Decisions to Give Downs and Hold Review Boards*

Most instructors felt that SNAs entered the training program with more or less ability to do the job, that at each stage in the screening process SNAs were tested, and that those least able to do the job were attrited. There was, in the eyes of most instructors, a single dimension of ability which was sometimes measured by academic scores but most often measured by cockpit or simulator performance. <*>

Based on this point of view, the SNAs who earn high scores in basic/primary flight should be the ones who earn high scores in intermediate flight and high scores in advanced flight. Similarly, SNAs who do well in academics should do well in flight. On the other hand, SNAs who were in trouble in one stage of training -- receiving more downs and being sent before review boards more often -- should have the same trouble later on. In the formal language of measurement theory, the mean combined flight or academic score, the total number of downs, and the number of boards held at each stage of training is a measurement of student flight aptitude; and the correlation between the same measurements taken in two different stages of training is the test-retest reliability of that measurement.

<*> The one exception to this perception that ability is a single dimension was in advanced jet training, where a number of instructors said that the students that they failed would have often been very good candidates for flight in one of the other pipelines -- that some people who are quite good pilots simply couldn't think fast enough to keep up with a jet, but might be fine in a slower plane.

In Table 4.20 we present correlations between academic and flight performance scores at different stages of flight training, for the sample of SNPs represented on the JHU-ATJ data tape. We examine the correlation between SNP scores in any one stage of flight training and their scores in earlier and later stages of flight training.

If instructors are able to accurately describe the performance of a SNP in either an academic exercise or in the cockpit, and those instructors are given a detailed and technically correct methodology for recording their description, then the instructors who evaluate a SNP in primary training should give the candidate scores similar to scores the candidate will receive in intermediate and advanced training. This seems to be the case for both academic and flight scores.

Table 4.20

Correlations between Phases of Different Types of Grades for Student Naval Pilots

(Correlation coefficients, decimal omitted)

EARLIER PHASE	LATER PHASE			
	Acad Score	Flt Score	No. of Downs	No. of Boards
Mean, All Pipelines				
Academic Score	40	33	-17	-13
Flight Score	20	59	-25	-22
No. of Downs	-17	-25	13	16
No. of Boards	-10	-16	11	15
Helo Pipeline				
Academic Score	46	38	-26	-18
Flight Score	25	60	-28	-23
No. of Downs	-17	-30	24	27
No. of Boards	-14	-24	21	26
Jet Pipeline				
Academic Score	36	22	-19	-14
Flight Score	0	54	-30	-20
No. of Downs	-20	-16	10	11
No. of Boards	- 4	- 2	0	2
Maritime Pipeline				
Academic Score	39	38	- 6	- 8
Flight Score	34	64	-16	-24
No. of Downs	-15	-28	4	7
No. of Boards	-12	-22	12	17

There are over thirty recorded evaluations in SNP flight training: mean flight grades, mean academic grades, number of downs received and number of review boards held, recorded separately for each stage of training and for each pipeline (helo, jet, maritime). We have computed the correlations among all these evaluations -- for example, the correlations between flight grades in primary and the number of downs received in intermediate flight training. In Table 4.20, we summarize this large number of correlations by computing the average correlation of all evaluations of one type (either academic scores, flight scores, numbers of boards, numbers of downs) with all evaluations of the same type which occurred in a later stage of training.

For example, academic scores are awarded in primary training and again in advanced training. The correlation between the scores SNPs earned in primary academics and in advanced academics in the Helo pipeline is .46. In the Jet and Maritime pipelines, the correlations are .36 and .39, for an overall average shown in the top panel of Table 4.20 of .40. A second example: flight scores are awarded in primary, intermediate and advanced training. In the Helo pipeline we found that the correlation between the flight scores earned in primary and those earned in intermediate and advanced were .59 and .69 respectively, while the correlation between the flight scores earned in intermediate and those earned in advanced was .51. Taken together, these three correlations average .60, which is entered in Table 4.20 in the Helo pipeline section in the second row and second column.

A third example: there is generally a modest correlation between academic scores and flight scores. For example, again using the Helo pipeline for illustration, we find that academic scores earned in primary correlate on the average .38 with flight scores earned in intermediate and advanced. Also, flight scores earned in primary and intermediate correlate on average .25 with academic scores earned in advanced.

The correlations between the number of downs and the number of review boards held for each candidate at each stage in training, however, are typically quite low. For example, the correlation between the number of downs earned during primary training by SNPs in the jet pipeline correlates .18 and -.11 with the number of downs the same SNPs earned in intermediate and advanced training. The correlation between the number of downs earned by jet SNPs in intermediate training and the number they earned in advanced training is .22. The three correlations taken together give an average of .10, which is reported in row 3, column 3 of the jet pipeline section of Table 4.20. <*>.

<*> One factor to be considered is that the number of downs held and the number of boards held are skewed distributions with means sometimes quite close to 0. This has the effect of forcing the correlations to be low. In order to determine whether the higher correlations observed for flight or academic scores is the result of the differences in the kind of distributions, we reconstructed the flight and academic scores, reducing them to a simple 0, 1, 2...type scale with exactly the same distribution as the number of downs or boards typically awarded in a stage of training. When we did this we still found that correlations between flight scores from one stage to the next or academic scores from one stage to the next were considerably higher than the correlation between the number of downs or the number of boards awarded at each stage. In every case the correlation between the scores was higher, and in the jet and maritime pipelines they were generally much higher. In the helicopter pipeline the differences were not as great.

Table 4.21
Crosstabulation of Number of Downs Obtained
in Intermediate and Advanced Strike (Jet) Pilot Training

ADVANCED DOWNS	INTERMEDIATE DOWNS: 0	1-2	3+	TOTAL
0	36 (33)	37 (38)	6 (8)	79
1-3	44 (43)	52 (49)	6 (11)	102
4+	4 (8)	7 (10)	9 (2)	20
TOTALS	84	96	21	201

$r = .22$

Note: Number in parentheses is expected number if correlation between stages is zero. The actual correlation is .22.

In order to decide how large these correlations were in practical terms, we crosstabulated in Table 4.21 for each jet SNP the number of downs the candidate earned in intermediate and again in advanced. We used these categories specifically because they show one of the largest positive correlations in our data -- intermediate jet downs and advanced jet downs are more strongly related than most of the examples we could have used.

The pattern we find, however, is not very encouraging. Of the 201 jet SNPs, 84 (42%) received no downs during intermediate training. One would assume that most of these SNPs would not get downs in advanced training, but this is not the case -- only 36 (46%) got no downs in advanced training. At the same time, of the 21 SNPs who were in the greatest trouble in intermediate flight -- getting three or more downs -- six went on to get no downs at all in advanced flight. It is always gratifying to see a student who is doing poorly in one stage of training suddenly become an excellent student at the next stage. However, under this system a very large number of SNPs are performing this unusual feat.

Actually, the relationship between the number of downs in intermediate and advanced is surprisingly close to random. The number in parentheses in each cell of the table indicates the number of cases that would occur if there were no relationship between performance in intermediate and in advanced. In most of the cells, the actual numbers are close to the number predicted by assuming no relationship.

Table 4.22 illustrates these relationships in yet another way. It shows the performance histories of 40 randomly selected SNPs in advanced jet training. These SNPs are ranked by the number of downs they received in intermediate flight training, and within that ranking by the number of downs they received in advanced flight training. At the bottom of the table we show the medians on the standardized flight scores and the standardized academic scores in primary, intermediate, and advanced. Because the medians would be meaningless for distributions as low as the count of number of downs and number of boards, the mean is shown for the first six columns instead of the median.

For seven of these 40 SNPs, the number of downs received seems quite inconsistent between intermediate and advanced. Two of these SNPs were attrited. One, (Student 19) received no downs at all in intermediate, but received 7 downs in advanced; the other (Student 31) received only one down in intermediate but received 8 downs in advanced. The flight scores earned by these two SNPs help explain these inconsistencies. Student 19 had an average flight score in intermediate of 50, a median score. This SNP's performance was not exceptionally good, and the candidate seems to have been a bit lucky to receive no downs in intermediate. Similarly Student 31 had a flight score of 45 in intermediate -- well below average and indicating that the student might do badly in advanced training.

The performance of Student 30 also deteriorated considerably between intermediate and advanced. Student 30 received four downs in advanced, after having received only one in intermediate. Also, this student's flight scores were reasonably good in both intermediate and advanced. The experience of Student 30 is difficult to explain.

Table 4.22
Performance of 40 Randomly Selected Advanced Strike Student Pilots

Student Number	DOWNS			BOARDS			FLIGHT SCORES			ACADEMIC SCORES		
	PRI	INT	ADV	PRI	ACA	ADV	PRI	INT	ADV	PRI	INT	ADV
1	0	0	0	0	0	0	50	50	54	39	37	63
2	0	0	0	0	0	0	53	45	60	57	54	72
3	0	0	0	0	0	0	55	50	54	63	50	56
4	0	0	0	0	0	0	58	55	54	58	51	54
5	0	0	0	0	0	0	60	55	67	57	61	66
6	0	0	0	0	0	0	68	65	64	57	57	50
7	1	0	0	0	0	0	55	55	57	40	24	56
8	0	0	1	0	0	0	48	45	54	54	46	56
9	0	0	1	0	0	1	53	50	50	67	58	65
10	1	0	1	0	0	1	53	55	57	38	31	59
11	0	0	1	0	0	0	55	55	56	62	58	57
12	0	0	1	0	0	0	55	60	60	58	50	56
13	0	0	1	0	0	0	60	60	50	54	48	45
14	0	0	1	0	0	0	60	55	57	56	54	73
15	0	0	1	0	0	1	70	45	47	64	54	61
16	0	0	2	0	0	1	63	55	54	65	60	57
17	0	0	2	0	0	1	70	50	60	48	59	59
18	0	0	3	0	0	1	65	50	50	62	67	68
19	1	0	7	0	0	4 *	50	50	44	48	48	38
20	0	1	0	0	1	0	53	50	54	64	54	61
21	0	1	0	0	0	0	75	60	50	44	33	44
22	0	1	1	0	0	0	53	55	57	49	39	58

Table 4.22 (Cont'd)

Student Number	DOWNS PRI	DOWNS INT	DOWNS ADV	BOARDS PRI	BOARDS ACA	BOARDS ADV	FLIGHT SCORES PRI	FLIGHT SCORES INT	FLIGHT SCORES ADV	ACADEMIC SCORES PRI	ACADEMIC SCORES INT	ACADEMIC SCORES ADV
23	1	1	1	0	0	0	55	60	60	55	57	66
24	0	1	1	0	0	1	63	45	47	64	59	56
25	0	1	1	0	1	0	65	50	47	48	46	59
26	0	1	2	0	0	0	53	40	54	42	47	70
27	0	1	2	0	0	1	58	45	54	58	44	51
28	0	1	2	0	0	0	63	50	54	66	63	63
29	0	1	3	0	0	1	50	50	54	53	40	71
30	1	1	4	0	0	1	50	55	57	53	54	53
31	0	1	8	0	0	2 *	55	45	47	53	52	64
32	0	2	0	0	0	0	58	60	60	50	33	61
33	1	2	1	0	0	0	48	50	54	42	30	39
34	0	2	1	0	1	0	58	50	54	51	44	56
35	0	2	5	0	0	0	50	35	44	49	55	54
36	3	3	0	0	1	0	50	40	50	30	20	48
37	0	3	4	0	0	1	45	55	44	56	49	58
38	0	3	4	0	0	1	55	50	44	48	54	63
39	1	4	0	0	3	0	55	50	54	48	20	60
40	0	4	6	0	1	2 *	50	40	47	46	34	65
Median							55	50	54	53.5	50	58
Mean	.25	.9	1.7	0	.2	.5						

* Student was attrited

Student 18 presents another difficult case to explain; after receiving no downs in intermediate, this SNP received three downs and was called before a review board in advanced. However, the cndidate's performance in terms of flight scores was consistent -- exactly 50 both times.

Three SNPs noticeably improved their performance. Student 32 received two downs in intermediate and none at all in advanced, and Students 36 and 39 received three and four downs in intermediate and none in advanced. Students 32 and 39 were performing reasonably well in intermediate -- Student 32 had an average flight score of 60 and Student 39 had an average flight score of 50, a score hardly representative of the worst students in this group of 40. It is not surprising that these two SNPs were capable of going through advanced without receiving any downs.

On the other hand Student 36, who received three downs and then none, may have been performing over his or her head in avoiding advanced downs -- this candidate's flight scores were below average in both intermediate and advanced.

Overall, the inconsistency of the data in Table 4.22 indicates that the number of downs received or boards held for students at one stage in training is a poor predictor of the number of downs or boards they would receive at the next one. In contrast, the actual scores earned in flight training are more stable. Between intermediate and advanced, flight scores rise by four points in this population. Thirty-one of the 40 SNPs changed their scores by this amount plus or minus 6 points, ranging from a loss of 1 point to a gain of 10 points. Only three SNPs gained more than 10 points and only six SNAs lost more than one.

Tables 4.20, 4.21 and 4.22 have all made the same point in different ways: the number of downs earned at any one stage is a less reliable predictor of the number of downs earned at the next stage than the scores earned at one stage are as predictors of the scores earned at another stage.

Awarding an academic score, a flight score, giving a student a down, or deciding to call a review board are all processes of measuring the SNA's performance. To give a SNA a down is to say that this candidate is not as good as other SNAs; the same is true of a low flight score, a low academic score, or deciding to hold a board. If these four measuring devices do assess general ability to be an aviator, then performance at one stage in the training pipeline should be correlated with performance at another stage. This is certainly the way instructors talk -- they say they have only good students because the weak students had been failed in the preceding pipeline stage, or they may say of a student, "I don't see how the student could have gotten through primary."

We have measured reliability of those testing devices by examining the correlation between grades or downs awarded at one stage of training versus scores or downs awarded at a second stage. The principal point of Table 4.20 is that the correlation from one stage to the next in the number of downs earned or the number of boards held for a SNP is generally much weaker than the correlation between flight scores or academic scores. If there is an underlying trait called "ability to learn to be an aviator," then two separate measurements of that trait done at two different times should correlate with each other. Applying that simple assumption to judging the performance of SNPs, the actual flight scores are a more reliable measure of performance than is the decision to award a down or the decision to hold a review board. By extension, it follows that the decision to attrite a candidate is also a less reliably made judgment than is the flight score.

The awarding of downs, the holding of review boards, and the decisions by review boards to attrite SNAs are to some degree designed to allow a subjective judgment. No one would be comfortable with the idea of making a decision to pass or fail a student purely "by the numbers." Instructors and officers want the opportunity to look the SNA in the eye and make their own judgment about the character and motivation that lie there. However, we are led to conclude

that one instructor's perception of character and motivation may differ radically from another's and the reason for one commanding officer's decision to hold a review board may differ radically from another's. The system is so subjective that personal bias may be having a larger impact than one would assume or desire.

4.4.10 *A "True Score" Analysis of the Grading Process*

Figure 4.5 models the grading process mathematically and graphically. The solid lines represent the average correlations between the flight scores and the number of downs at the earlier stages (either primary or intermediate) with the flight scores and number of downs in later stages (either intermediate or advanced) for students in the jet pipeline. In Figure 4.5 we have also created an imaginary factor called "true" aviation ability. We have shown with dotted lines the correlation of this true ability at one stage of training with the same true ability at a later stage of training and assumed that this true ability does not change and therefore this correlation is perfect, 1.0. We also show with dotted lines the correlation between true ability in each stage with the standardized flight score earned by the student and the number of downs that the student received.

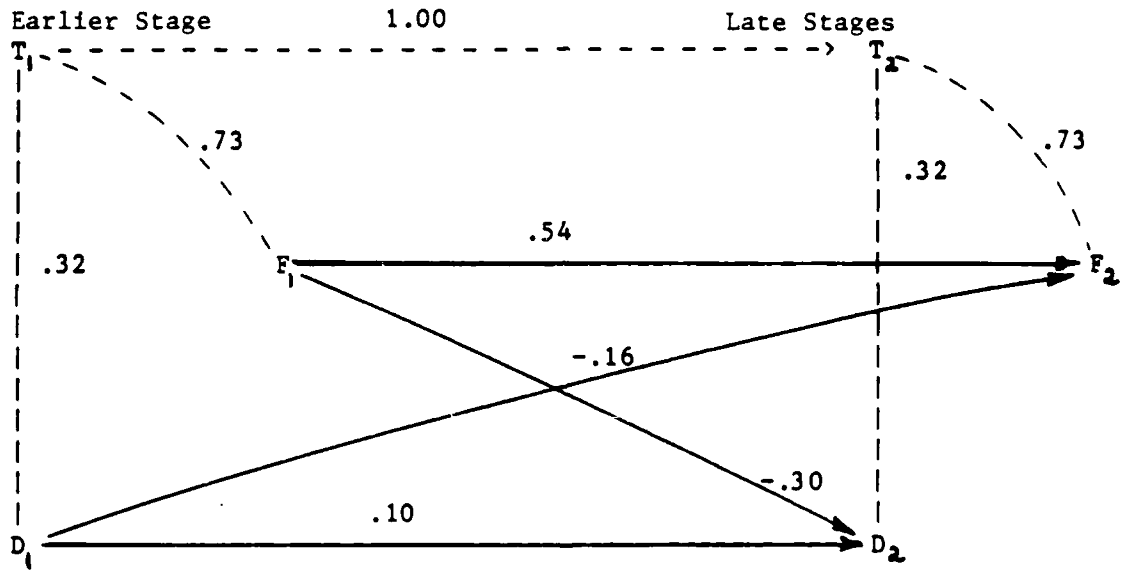
Figure 4.5

A Model of the Measurement of "True Aviation Ability"

T = True Ability
D = Number of downs
B = Number of boards
F = Flight score

Subscripts refer to any two different training phases

Sample Model: Relationship of true score (T) to flight score (F) and number of downs (D) in Strike ("Jet") Pipeline:



		Jet	Helo	Mari
Computed correlations: (— — — —)	TB	.14	.51	.41
	TD	.32	.49	.20
	TF	.73	.77	.80
Predicted/Actual correlations:	FD	-.23/-.16,-.30	-.38/-.28,-.30	-.16/-.16,-.28
	FB	-.10/-.20,-.02	-.39/-.23,-.24	.33/-.24,-.22
	DB	.04/ .11, .00	.25/ .27, .27	.08/ .07, .12

It can be shown mathematically that the correlation between one measure of ability (such as the number of downs received at one stage of training) with a second measure of ability (such as the number of downs received at a second stage of training) must equal the product of the three dotted correlations which make the indirect route, a sort of detour, connecting the two measures. In the case of the correlation from D1 to D2, the indirect route is the correlation from D1 to T1, the correlation from T1 to T2, and the correlation from T2 to D2. The product of those three numbers must equal .10. If we assume that the measure taken in Phase 2 is as strongly related to the true ability as is the measure taken at D1, then it follows mathematically that the correlation between D1 and T1 and the correlation between D2 and T2 are each simply the negative square root of the correlation between D1 and D2.

The model for the jet pipeline shows that flight score is correlated much more strongly with true ability, .73, than is the number of downs earned, .32. (We noted earlier that part of this is due to the fact that flight scores are a continuous distribution and therefore correlate better with each other than do the number of downs, which only take the value, 0, 1, 2... However, even if flight scores are reconstructed to have the same sort of distribution that number of downs do, they remain more highly correlated with each other than downs.)

The argument could be made that flight scores measure something quite different from the number of downs a student gets. One might argue that a down is given not for a technical error of flying which might reduce one's score, but because in the informed judgment of the instructor, this student is failing to learn what the student needs to know -- failing to demonstrate that he or she will be able to become a qualified aviator. Instructors talk about evaluating a candidate asking themselves whether they would be content to fly with this person on their wing.

This argument seems plausible, but the statistics do not support it. Perhaps the most important finding in all these data is that if one wanted to predict the number of downs a SNP would earn at a particular stage of training, one would *not* use the personal judgments of flight

instructors in the preceding stage of training as the most reliable information for making this prediction. Instead, one would use the flight scores that those instructors assigned, because the correlation between the flight scores of the preceding stage and the downs in the next stage is higher than the correlation between the number of downs in a preceding stage and the number of downs in a later stage. (Again, this pattern holds when scores are corrected for the different nature of their distributions.)

The same argument holds for the number of boards held for a candidate: in general, flight performance as measured by grades is a better predictor of the number of boards that a SNA will receive in the next stage of training than is either the number of downs or the number of boards received at the earlier stage. (Again, this is not generally as true in the helicopter pipeline as in the jet and maritime pipelines.)

In Figure 4.5, we test this counterhypothesis mathematically in the bottom of the figure. If flight scores and downs measure the same thing, then mathematically, one can estimate the correlation between these two different measurements as simply the product of the three dotted correlations on the "detour" path: D1F2 = (D1T1) (T1T2) (T2F2) and F1D2 = (F1T1) (T1T2) (T2D2). Both these estimates are the same, since D1T1 = T2D2 and T2F2 = F1T1. For the Jet pipeline, the estimate is (.32) (1.0) (.73) = .23. If number of downs measures something different from flight scores, the correlations between D1 and F2 and between F1 and D2 will be noticeably lower than the predicted .23. But in general, these correlations are not lower: for the jet pipeline, -.23 is exactly the average of the real correlations given in Table 20: D1F2 = -.16, and F1D2 = -.30; the estimated helicopter correlation -.38, is .09 higher than the average of F1D1 = -.28 and D1F1 = -.30, and the predicted maritime correlation of -.16 is .06 lower than the average of the two measured correlations.

The same analysis can be done with number of review boards rather than number of downs; the number of boards held is an even less reliable measure than the number of downs, with TB =

.14 for the jet pipeline. In the lower part of Figure 4.5 we compute predicted values of FB and DB and compared them to F1B2, B1F2, D1B2 and B1D2. None of the comparisons support the thesis that number of boards received measures something different from flight scores.

4.4.11 *The Implications of This Analysis for Minority Attrition*

We made a point earlier in connection with Figure 4.4: In general, Black and Hispanic students fare better relative to nonminorities in their flight scores than they do in the number of downs they receive, the number of boards that are held for them, and whether they are attrited. Our analysis clearly shows that all three of these measures of ability to become a naval aviator are more subjective than the flight scores earned. This raises a question: Will subjective judgments be made which are less favorable to minorities than one would expect? We address this question by drawing on both our knowledge of race relations in the United States and elsewhere and our understanding of the social dynamics of naval aviation training.

The instructor who is required to decide whether to give a candidate a "down" or not is confronted with an extraordinarily difficult judgment. Instructors generally do not hold that role on a permanent full-time basis; rather, they do short tours, planning for future tours, any of which could suddenly become a life-threatening adventure. When instructors evaluate SNPs or SNFOs, they may well ask "How would I feel flying with this man or woman next to me?" -- they know in an abstract way their own lives and those of their friends may depend upon this person's performance. At the same time, the instructors can identify with their students. It is easy to remember that only a few short years ago they were nervously sitting in the same seat experiencing the same anxiety about this check hop. It is easy for the instructor to feel a comraderie and kindness toward the slightly shaky candidate under review. Finally, the Navy is a very tight community, in which officers work for very long shifts with other officers. In AOCS, unpopularity among one's classmates is in extreme cases sufficient for attrition on the basis of not having "officer-like qualities."

The instructor is supposedly reaching into a store of flying knowledge and a sense of human character and deciding over and above the actual performance shown whether this candidate should be given a down or not. In fact, we have seen from the statistical analysis that the decision to give a down is an unreliable judgment. It is simply not possible for a twenty-eight year old instructor (and not much easier for a forty-eight year old) to look at a student and decide independent of the flight just observed whether the SNA will be a good candidate for success in the Navy. No civilian professional personnel executive believes it is possible to make these kinds of judgments.

Social psychological experiments done over the last fifty years have shown that when people are required to make judgments in a situation of great uncertainty, they will lean heavily on the judgment of their colleagues. In this situation it is easy to imagine a student getting a reputation of "dirtball" on the basis of some slight clues and having the reputation spread among instructors. Instructors worry about this; some make a point of not reading the student's jacket in advance in order to take a fresh view; there are long arguments about the advantage and disadvantage of having the check hop flown with an instructor who does not know the student.

On the basis of our 200 interviews with students, instructors, and fleet aviators, we have found the instructor's role to be highly stressful. Instructors are often working very long hours, compounded by scheduling problems and equipment failure. They are sometimes angry about having received a less desirable tour than they would have liked; many people talked about instructor burnout. In the face of this stress, the instructor's personal feelings about a student might play a large role in the decision to give the student a down or not. Indeed, we heard precisely those sorts of comments from instructors who were clearly bending over backwards to help a student whose performance was marginal. One instructor talked about not giving a student a down unless he had verified from the jacket that the student would not be sent before a board if he got one more down. This comment was not out of character with other comments

received, and more importantly, *the comment was made aloud in the presence of three other* instructors, none of whom expressed any disapproval or surprise.

Given the situation we have described, what happens when a minority student appears? We think the process might be very simple. It is (and this is important) *not* generally speaking a matter of racial prejudice on the part of either the student or the instructor. The fact is simply that the minority student is unfamiliar to the instructor, different in such an important way the instructor cannot make a judgment about the candidate. To the typical instructor, the minority SNA does not look like one's brother, one's father, one's roommate. And yet, the instructor is called upon to make a judgment about whether to trust this person in a life-threatening situation, whether this candidate should hold a command position, perhaps someday working closely with the instructor for long hours; and finally, whether the instructor feels warm enough toward this student to give the student a break. Perhaps it is this last consideration that is the most important -- what we saw in Table 4.19 is that nonminority students with very low flight scores were less likely to be attrited than were minority students with the same scores. The nonminority students were given "breaks" that the minority students were not given.

We heard one APFI instructor whom we respected mention that a Hispanic candidate who had performed particulary badly had ruined the reputation of all students from his minority group. This is, of course, ethnic "stereotyping" -- judging people by their group membership. The instructor is assuming that other instructors will judge other Hispanics by remembering this one's poor work. We quote the instructor to make an obvious point -- that all of us tend to generalize on the basis of whatever physical or social characteristics we can find in order to categorize a student. Given a highly ambiguous and extremely difficult evaluation job, instructors look to their peers; and both they and their fellow instructors will look at whatever characteristics of a particular student they can find to help make a decision.

This situation occurs frequently in civilian life (where there is a good deal less pressure in most institutions to provide equal opportunity). In a study done by one of the authors of this report, it was shown that minority students of the same general ability as nonminorities earned lower grades when they were in public schools with more nonminority teachers. This was either because nonminority teachers discriminated against them or because minority teachers discriminated in favor of them -- probably both processes were occuring. In another study, one of two videotapes of the same Black actress posing as a job candidate was observed by employers: if the employer saw the tape in which the actress spoke precisely the same text and presented exactly the same resume, but with a heavy Black accent, the employer was likely to see her as being less honest or reliable. In a third study, employers evaluated Black job candidates who had attended suburban schools much more favorably than Black candidates who had attended central city schools, without making the same distinction among white candidates -- apparently the employers needed to know that the Black job candidate had demonstrated an ability to work comfortably with whites.

At the same time that the instructor is placed in a stressful position, and asked to make a highly personal judgment about the student's character, motivation, and future potential in a situation where such a judgment cannot be made at all easily, we find the student in a perhaps even more stressful situation. If the student is a minority, perhaps from a segregated community which offered relatively little experience working with nonminorities, the SNA may be exceptionally anxious, untrusting of the instructor and unconsciously making clear the distrust and fearfulness felt in this situation. The distrust and fearfulness can easily be read by the instructor as either hostility or a fear of flying itself. One can expand this scenario further but the general point is made. It is not at all necessary that the minority student be prejudiced against whites, or that the white instructor be prejudiced against Blacks or Hispanics. The mere fact that the instructor and the student come from two different backgrounds and are unfamiliar with each other can set off the dynamic we are talking about.

We have described this dynamic in terms of the interaction between a single instructor and a student regarding the decision to award a down. Precisely the same kind of dynamic can occur in a review board. In talking with officers who have served on review boards, we are struck that a great deal hinges upon the demeanor of the student -- giving the impression that one has the right attitude toward flying and toward the Navy is of great importance in many hearings. One can imagine a minority student, especially one from a largely segregated background or with a language difficulty in English, having an experience of enormous stress and performing in a flustered and unconfident manner. It is easy to imagine the members of the review board, in the face of great uncertainty about what decision they should make, looking at this behavior and being influenced by it.

4.4.12 *Summary of Minority Analysis*

What we have presented is a scientific argument which supports a hypothesis but does not prove it. The hypothesis is consistent with social science theory and explains the following set of facts that we have uncovered.

1. Minority candidates perform worse in terms of their probability of being attrited than they do in their flight or academic scores. This is especially true of SNFOs, but seems true of SNPs as well.
2. The poor performance of minority SNAs cannot be explained by their lower scores on the AQT and FAR, and minorities are as likely as nonminorities to have a technical college major.
3. The judgments made by instructors in deciding whether to give a candidate a down and by senior officers in deciding whether to schedule a board for a SNA are such that a different officer in a different training squadron looking at the same candidate would be very likely to make a different decision. The number of downs earned and the number of review boards held in the preceding stage are very poor

predictors of whether the SNA will receive a down again or see a second review board during the next stage of training. However, the flight scores and academic scores the students earned in the earlier stage are reasonally good predictors of the scores they will receive in the next stage.

4. We analyzed the probability of attrition for minority and nonminority students with similar flight grades; we found that among students with low flight grades, nonminority students were much less likely to be attrited than were minority students.

Based on these facts, we conclude that minorities are disadvantaged by the subjective elements of the decisions to award downs and hold boards and by extension the subjectivity of review board decisions. This explains why their performance is better when measured by flight scores and why their higher attrition cannot be explained by such background factors as AQT or FAR scores.

If this analysis is correct, then making attrition decisions purely on the basis of flight and academic performance scores would reduce minority attrition (or increase nonminority attrition). In the analysis of Figure 4.4, we concluded that perhaps one-third of all decisions to attrite a minority would not have been made. This does not state all of the case, however, because there is still ample room for subjectivity and bias in making decisions about what flight score a student has earned.

CHAPTER FIVE

A Profile of Contemporary Accessions in Naval Aviation Training

(May 1986 - September 1986)

5.1 INTRODUCTION

This chapter presents a descriptive profile of contemporary Student Naval Aviators (SNAs) -- AOCS and APFI accessions, and minorities and nonminorities. These statistical profiles are drawn primarily from the Naval Aviation Schools Command (NASC) Student Information Survey developed by Johns Hopkins University as part of an expanded longitudinal data base of student training records. Also included in this data base are aviation selection test scores and NASC training performance data merged from student records and grade cards, along with selected college characteristics merged from the national surveys by the Higher Education Research Institute and the U. S. Department of Education. Because they represent different recruitment markets or population pools, separate profiles are presented for Aviation Officer Candidate School (AOCS) and Aviation Pre-Flight Indoctrination (APFI) accessions, and minorities and nonminorities. The profiles<*> presented here are based on 756 AOCS<**> and 242 APFI accessions from late May 1986 through early September 1986 who completed the NASC Student Information Survey.<***>

<*> Graphic and occasionally tabular illustrations are presented in the text of this chapter to facilitate readability. More detailed information can be found in the supporting tables in Appendix C. Unless otherwise noted, differences between the procurement categories or among race/ethnic groups are discussed only when they are statistically significant.

<**> Because the Student Information Survey was administered during the first week of training at Naval Aviation Schools Command, the AOCS group includes both candidates who persist through outposting and Pre-entrance (voluntary--DOR and involuntary--NPQ) attrites.

<***> Item subsample sizes may vary slightly as a result of incomplete, inaccurate or missing responses; percentage distributions may not sum to 100% due to rounding.

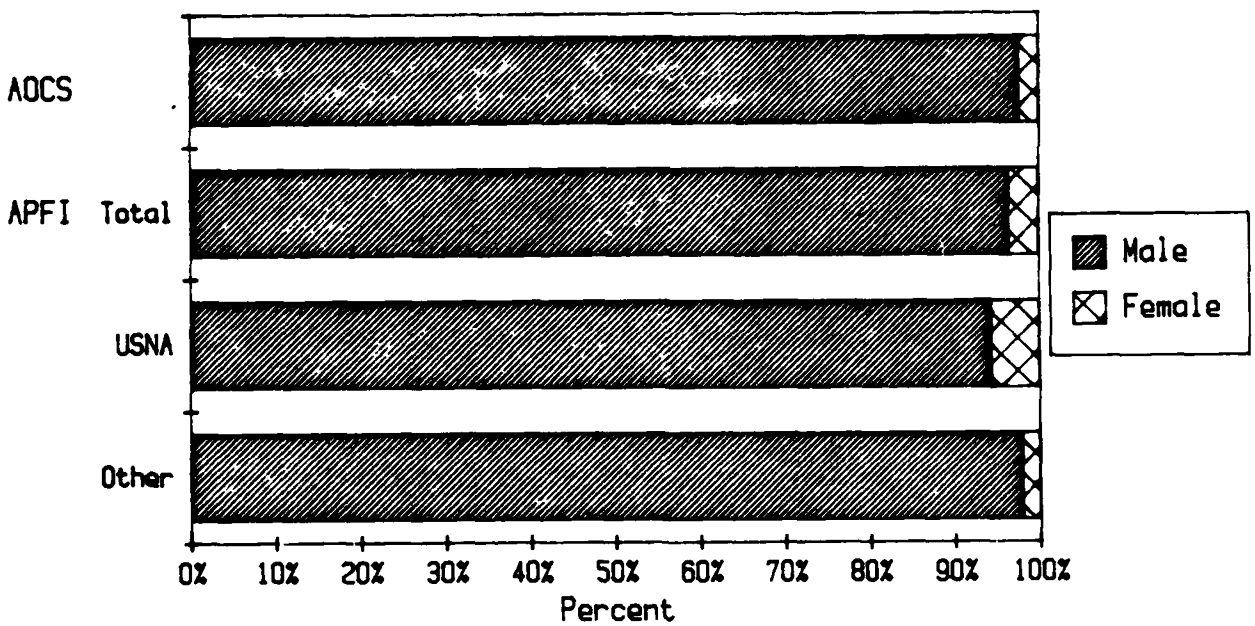
The potential utility of this type of data is multifaceted. First, ongoing surveys of accessions in naval aviation training can provide naval manpower operations and research personnel with broad and comprehensive baseline data for monitoring over-time trends in quality of input in aviation training. Second, a baseline survey data system -- subject to periodic modification and updating as dictated by supply and demand factors (e.g., increased technical emphasis) -- can help provide the Navy with useful dynamic information for identifying "risk-factors" associated with attrition in aviation training independent of costly and time consuming revisions in "cognitive" and "psychomotor" selection procedures. Third, extensive data about the demographic, experiential and social-psychological backgrounds of individual accessions can be correlated with student difficulties at specific stages of training to identify potential points of intervention to minimize attrition and enhance the productivity of aviation training without lowering standards or sacrificing quality of output.

5.2 DEMOGRAPHIC CHARACTERISTICS

Figures 5.1 through 5.10 present a demographic background profile of Student Naval Aviator accessions.

5.2.1 GENDER (Figure 5.1): Among 998 Student Naval Aviators accessed during the study period, twenty-eight (2.8%) were female. APFI accessed a slightly, but not significantly, higher proportion of female SNA's (3.7%) than did AOCS (2.5%). Also, female APFI Student Naval Aviators were more than two and one-half times as likely to be accessed through the U.S. Naval Academy (5.8%) as through other commissioning sources (2.2%) such as NROTC, USMC.

Figure 5.1
SEX DISTRIBUTION BY ACCESSION SOURCE

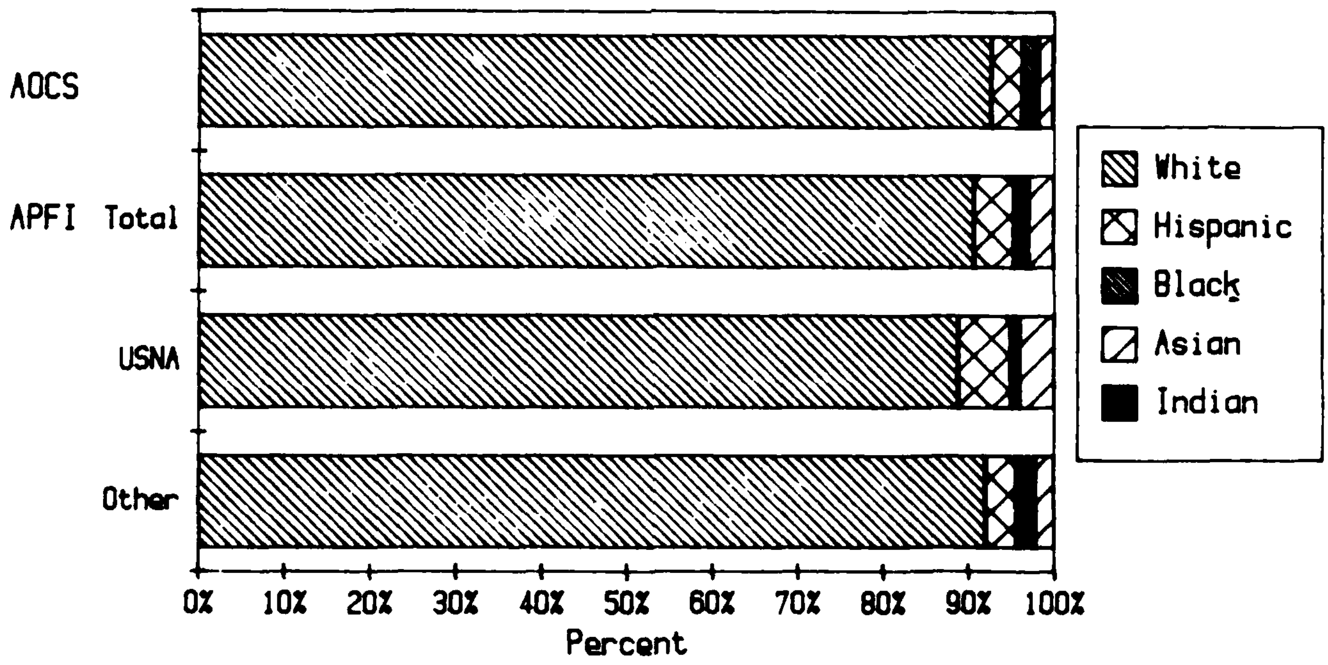


5.2.2 RACE/ETHNICITY (*Figure 5.2*): The race/ethnic distributions in Figure 5.2 reveal a significant pattern of minority (especially Black) underrepresentation. Among our sample of AOCS accessions, Blacks comprise 1.9%, Hispanics 3.6%, Asian Americans 1.7%, and American Indians .1%. Among APFI accessions, Blacks comprise 1.7%, Hispanics 4.7%, and

Asians 4.3%. The U.S. Naval Academy accounts for the greater proportion of Hispanic and Asian APFI accessions. However, Black APFI accessions are twice as likely to have received their commissions from sources other than the USNA.

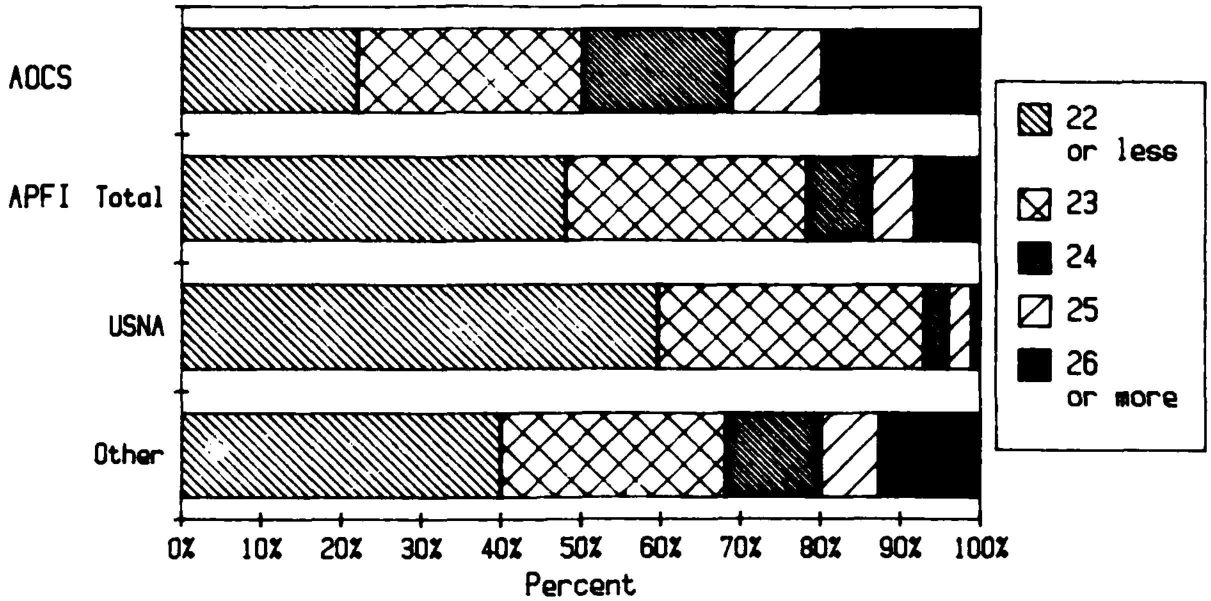
The current NASC accession rates for Hispanics (3.9%) are comparable to recent reports of the Hispanic male share (3.3%) of baccalaureate degrees conferred (see Thomas, 1986; Trent, 1984; Minority Officer Accession Task Force, 1984). A similar overall pattern exists for current accession rates of Asian Americans and the Asian American male share (2.6%) of baccalaureate degrees conferred. However, the current Black (1.8%) accession rate in naval aviation training falls considerably below the Black (5.4%) male share of baccalaureate degrees conferred and considerably below the pool of Black (3.5%) males earning baccalaureate degrees in technical fields. Continuation of this pattern will likely leave the aviation community well short of reaching the adjusted Navy Affirmative Action Plan (NAAP) goals for Black representation among the overall naval officer corps recommended by the Minority Officer Accession Task Force (1984).

Figure 5.2
RACE DISTRIBUTION BY ACCESSION SOURCE



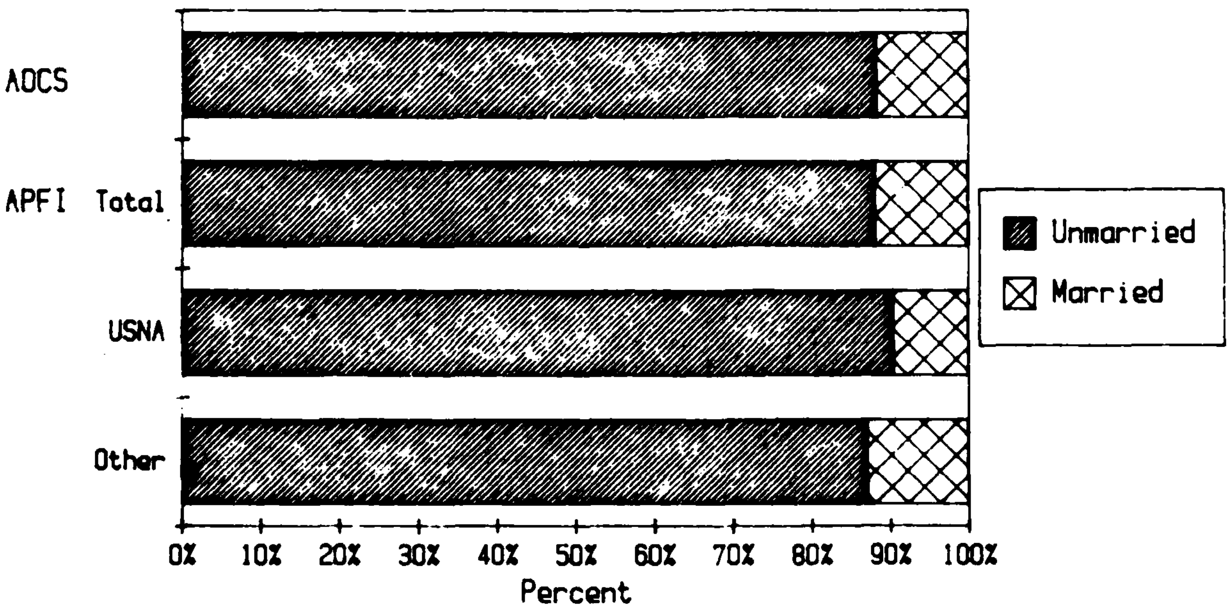
5.2.3 AGE (Figure 5.3): The typical Student Naval Aviator accession is quite young (mean = 23.71 yrs), but significant procurement source differences in average age are apparent. Among AOCS accessions the average age is about 23.94 years; the typical APFI accession is 23.03 years old. Moreover, there are more than twice as many APFI accessions (48.1%) as AOCS accessions (22.0%) among the group 22 years or younger and less than half as many among the group 26 years or older (8.1% v. 19.7%, for APFI and AOCS respectively). These patterns are most pronounced for Student Naval Aviators from the USNA, who tend on average to be significantly younger (mean = 22.53 years) than other NASC accessions, including other APFI accessions (mean = 23.37 years). The overall AOCS-APFI accession age difference may relate to the tendency of civilian accessions to have first been employed in the civilian labor force (45.8% full-time/21.7% part-time) prior to their entry into naval aviation training. It may also be that the civilian application-acceptance-accession process for naval aviation training is much more protracted than that for commissioned officers, thereby increasing the average age of AOCS accessions., In either case, the relatively younger age of APFI, and particularly USNA, accessions may enhance their chances of successfully completing aviation training -- if age substantively affects important performance outcomes through physical conditioning, visual acuity, and the like.

Figure 5.3
AGE DISTRIBUTION BY ACCESSION SOURCE



5.2.4 MARITAL STATUS (Figure 5.4): Most (87%) AOCS and APFI accessions are single. Only about one in ten Student Naval Aviators of either procurement group reported being married at the time of accession into naval aviation training.

Figure 5.4
MARITAL STATUS BY ACCESSION SOURCE



5.2.5 GEOGRAPHIC ORIGINS (*Figures 5.5-5.6*): The residential background of NASC accessions is diverse across geographic regions. Among both AOCS (33.7%) and APFI (40.6%) accessions, the largest number grew up in the North while attending high school. Both groups had the lowest representation from the West, and both groups had fairly proportionate representation from the South and Midwest. Within the APFI accession category, the regional distributions for the U.S. Naval Academy and other commissioning sources are quite similar.

With regard to differences in hometown characteristics of student naval aviators, Figure 5.6 shows that nearly half of both AOCS (44.7%) and APFI (48.1%) accessions lived in small towns or rural areas while attending high school. However, nearly twice as many AOCS accessions (11.0%) as APFI accessions (5.9%) lived in large cities during similar stages of life. In contrast, APFI accessions (8.4%) are almost twice as likely as AOCS accessions (4.7%) to have lived in the suburbs of medium-sized cities. Although they compose only a small fraction of the total population of NASC accessions, these city-suburban differences may reflect the slightly higher status backgrounds (i.e. parents education) of APFI accessions noted below.

Figure 5.5
REGION OF HOMETOWN BY ACCESSION SOURCE

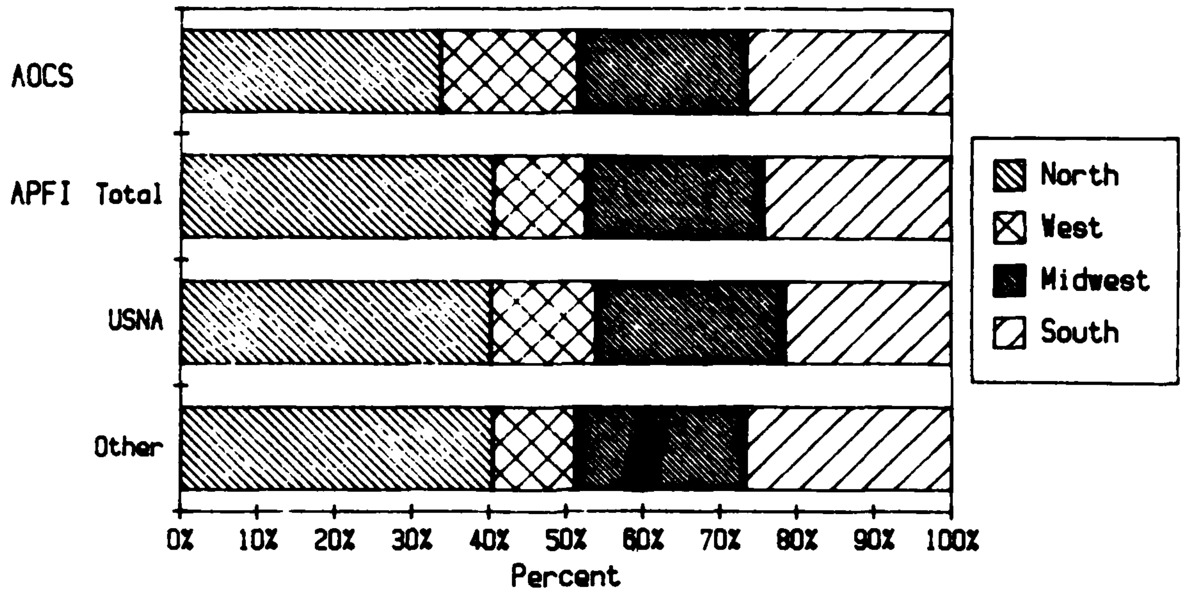
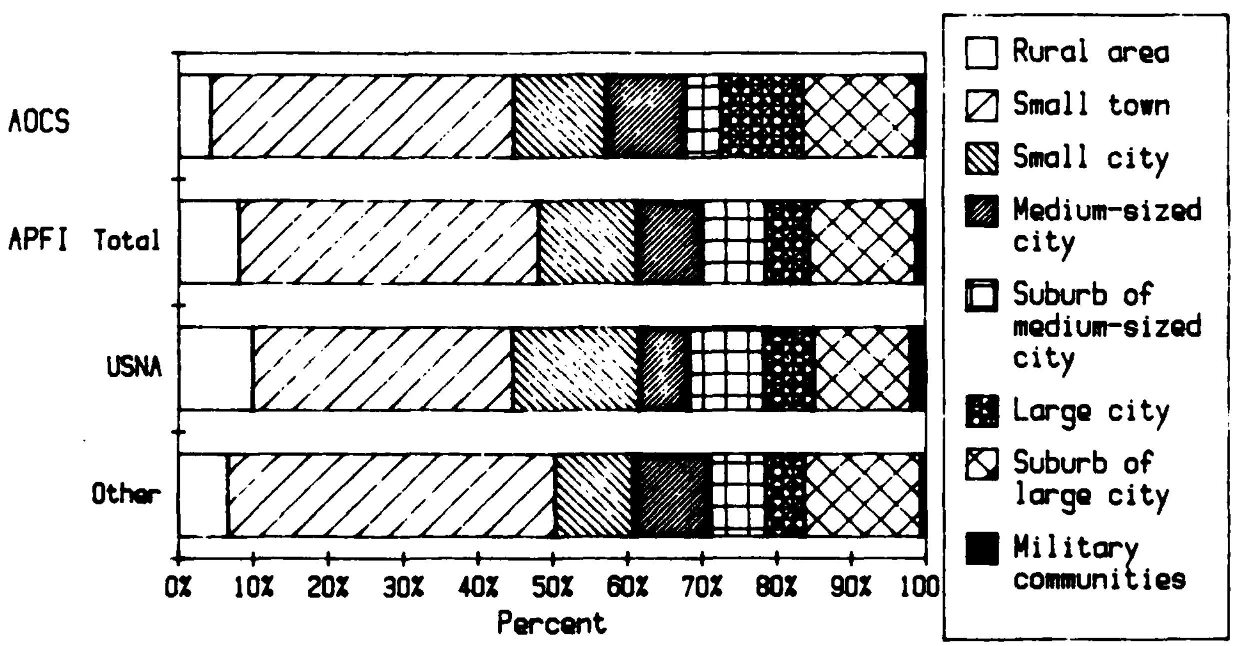


Figure 5.6
TYPE OF HOMETOWN BY ACCESSION SOURCE



5.2.6 FAMILY CHARACTERISTICS (Figure 5.7-5.10): Figure 5.7 shows that a vast majority of all NASC accessions were raised in traditional nuclear families (89.6% and 92.5% for AOCS and APFI, respectively) with both parents present. The typical pattern of family size shown in Figure 5.8 indicates that approximately three-quarters of both AOCS and APFI accessions have 1-3 siblings (AOCS mean = 2.52; APFI mean = 2.55). In addition, most SNA accessions come from generally well-educated families -- Figure 5.9 shows that approximately two-thirds have mothers who have completed at least some college or earned a college degree. However, this pattern is more pronounced among APFI accessions (69.8%) than among AOCS accessions (61.3%). As shown in Figure 5.10, high educational attainment is even more characteristic of the fathers of Student Naval Aviators. Roughly four out of five fathers of Student Naval Aviators have completed at least some college or earned a baccalaureate degree or higher.

Figure 5.7
FAMILY STATUS BY ACCESSION SOURCE

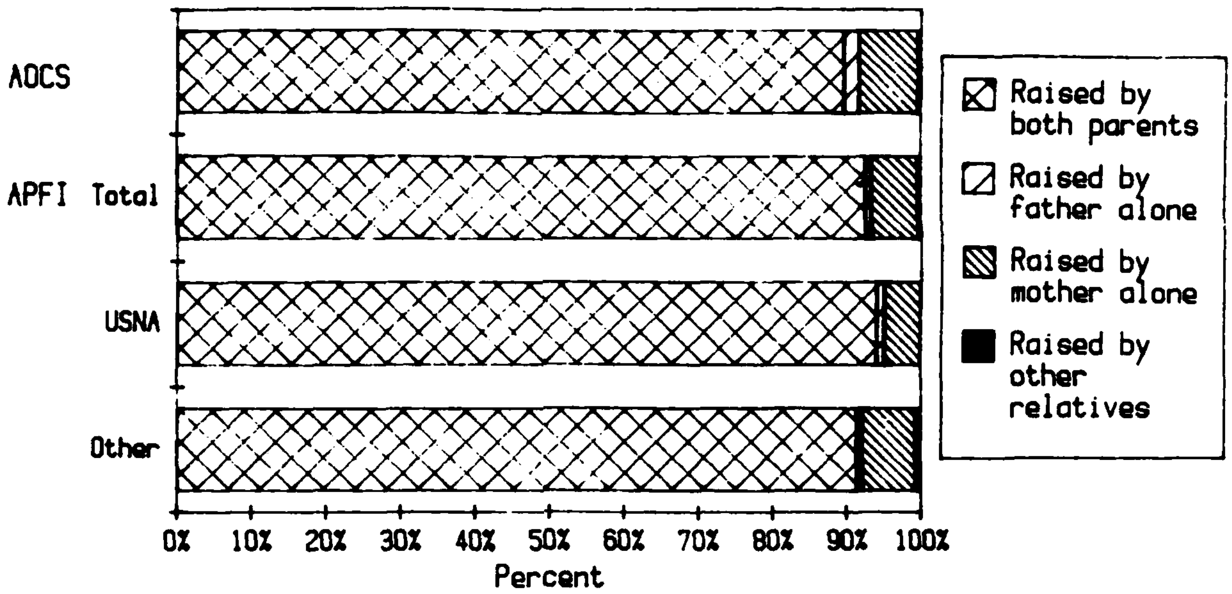


Figure 5.8
NUMBER OF SIBLINGS BY ACCESSION SOURCE

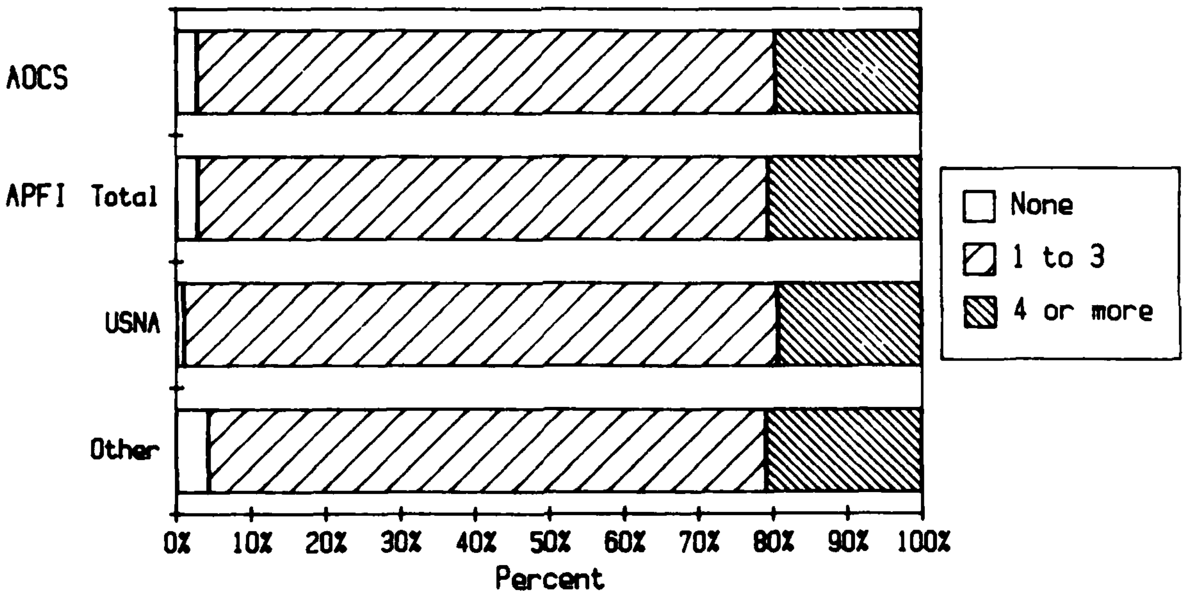


Figure 5.9
MOTHER'S EDUCATION BY ACCESSION SOURCE

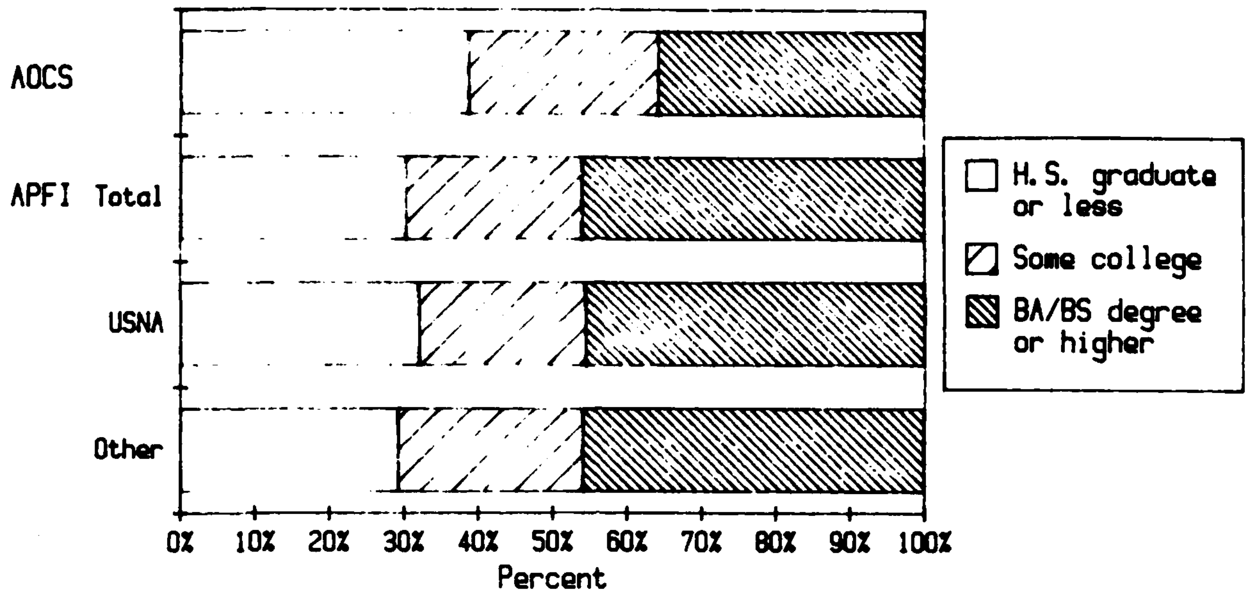
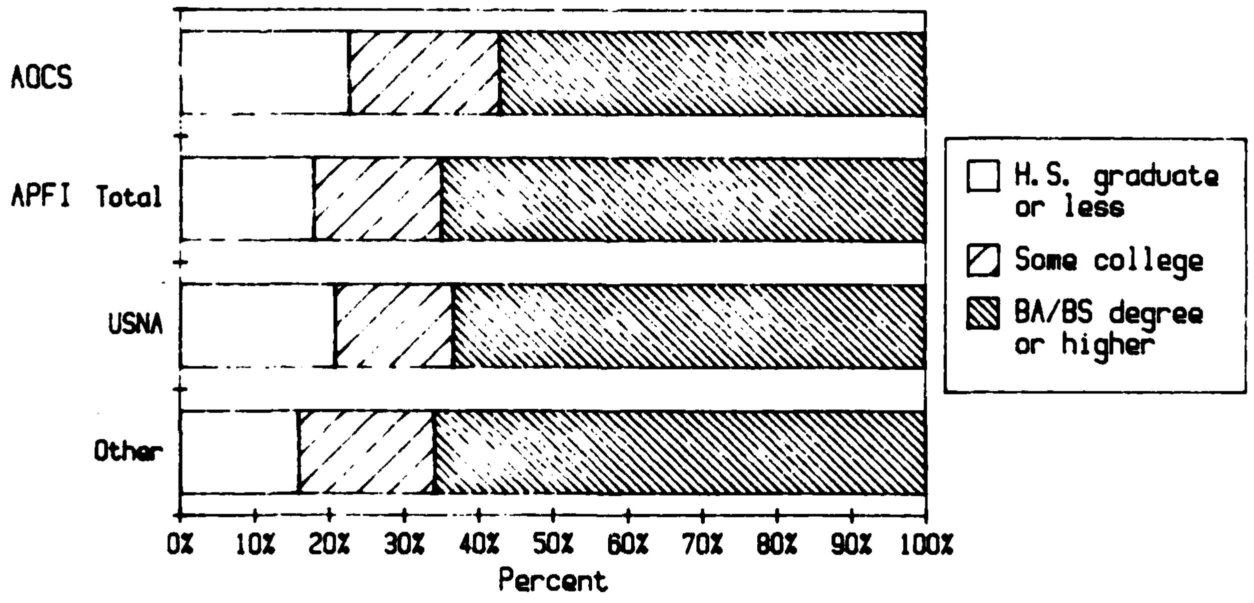


Figure 5.10
FATHER'S EDUCATION BY ACCESSION SOURCE

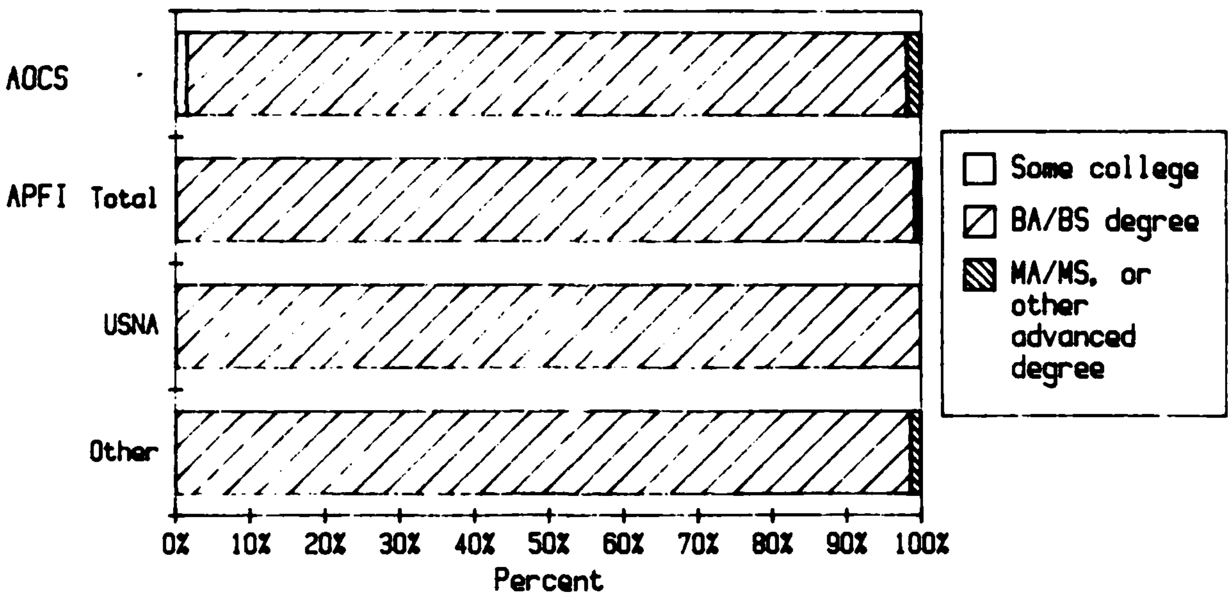


5.3 EDUCATIONAL BACKGROUND AND PREPARATION

Figures 5.11 through 5.28 present a profile of the educational background and academic preparation of Student Naval Aviators.

5.3.1 EDUCATION (*Figure 5.11*): Nearly all Student Naval Aviators hold a BA or BS degree. The comparable figures for AOCS and APFI are 96.7% and 99.2% respectively. Candidates entering naval aviation training through Aviation Officer Candidate School show a slightly more diverse pattern of degree attainment due to a variety of limited special entry programs such as the Naval Aviation Cadet Program (NAVCAD).

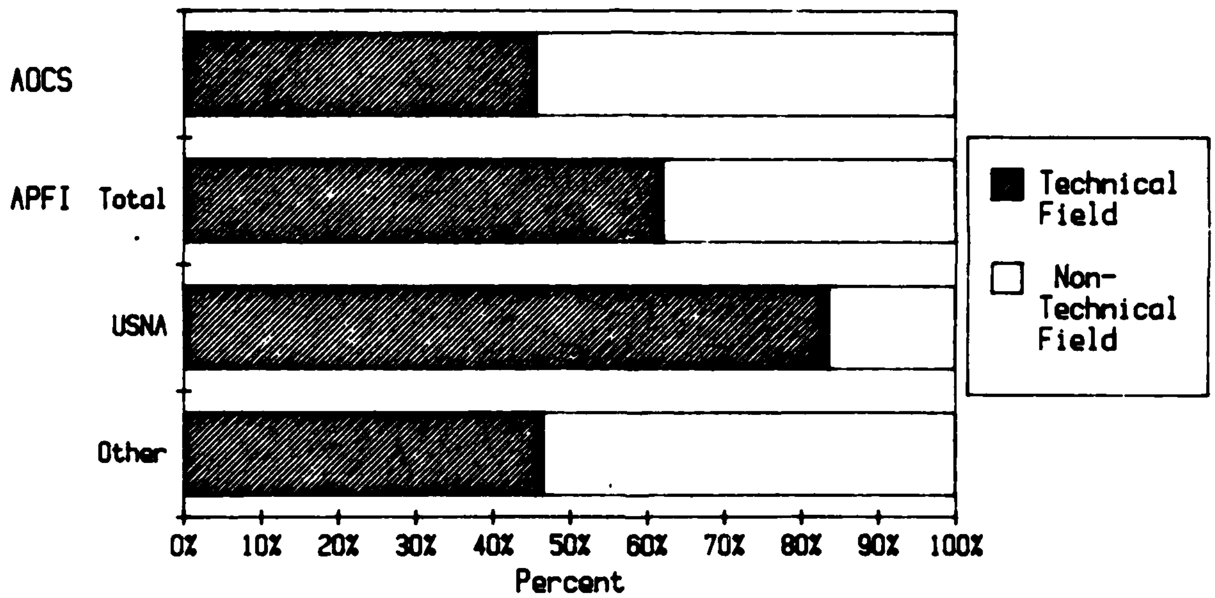
Figure 5.11
EDUCATION LEVEL BY ACCESSION SOURCE



5.3.2 MAJOR FIELD (Figure 5.12): Almost one-half of Student Naval Aviators earned their baccalaureate degree in a technical field, compared to only about one-quarter of all male college graduates (Trent, 1984). This pattern of technical major field specialization is more pronounced among APFI accessions (62%) than among AOCS accessions (45.5%). These differences reflect

the greater emphasis on technical specialties at the U.S. Naval Academy compared to the nation's colleges in general. Nevertheless, the statistics on both AOCS and non-USNA accessions in Aviation Pre-Flight Indoctrination suggest that the Navy is effectively tapping the current population of civilian male college graduates with technical majors. One recent study (Trent, 1984) reports national tabulations showing that roughly one out of four male college graduates earned a baccalaureate degree in a technical field, yet nearly one of two naval aviation accessions has such a degree.

Figure 5.12
MAJOR FIELD DISTRIBUTION BY ACCESSION SOURCE



5.3.3 ACADEMIC PERFORMANCE (*Figures 5.13-5.15*): Differences in college grades or class rank must be carefully interpreted, due to variations in the character and quality among the different types of undergraduate institutions typically attended by naval aviation accessions. However, these measures of student's prior academic performance can be useful for describing student academic quality inputs and potentially useful for predicting students' chances of future success in aviation training. The typical Student Naval Aviator earned C+, slightly above

average, undergraduate grades. As shown in Figure 5.13, the median *grade point average* (on a 4-point scale) among AOCS accessions (2.80) is higher than among APFI accessions (median = 2.70). However, this difference is largely attributable to the fact that the undergraduate grades of USNA accessions (median = 2.60) are lower than other APFI accessions (median = 2.80). Similarly, Figure 5.14 shows that in regard to *undergraduate class standing*, most Student Naval Aviators rank in the top half of their graduating class. As with college grades, AOCS accessions rank higher than APFI accessions, 86.9% and 70.8%, respectively. Again, however, USNA accessions (50.5%) are much less likely than other APFI accessions (86.4%) to rank in the top half of their undergraduate classes.

Overall, then, AOCS accessions exhibit higher undergraduate academic performance in terms of both grades and class standing than do APFI accessions (specifically, USNA graduates). These undergraduate performance differences may be partly attributable to the greater tendency of APFI accessions (specifically, USNA graduates) to major in more competitive and demanding technical fields and, as we shall discuss later in this section, the tendency of APFI accessions to have attended more selective and competitive colleges and universities. This explanation is supported by the data regarding *study time* shown in Figure 5.15. On average, APFI accessions reported devoting more time (mean = 21.16 hr/wk) to studying and doing homework in college than AOCS accessions (mean = 18 hr/wk). Again, this difference is in large measure accounted for by the relatively more intense study practices of USNA graduates.

In Chapter Four, we reported analyses illustrating the academic performance correlates associated with earning a degree in a technical field. However, officially earning a degree in a technical field and acquiring adequate technical preparation are not necessarily equivalent. In the following section, we see that many students who do not have technical majors have a good deal of coursework in technical areas under their belts.

FIGURE 5.13
UNDERGRADUATE GRADES BY ACCESSION SOURCE

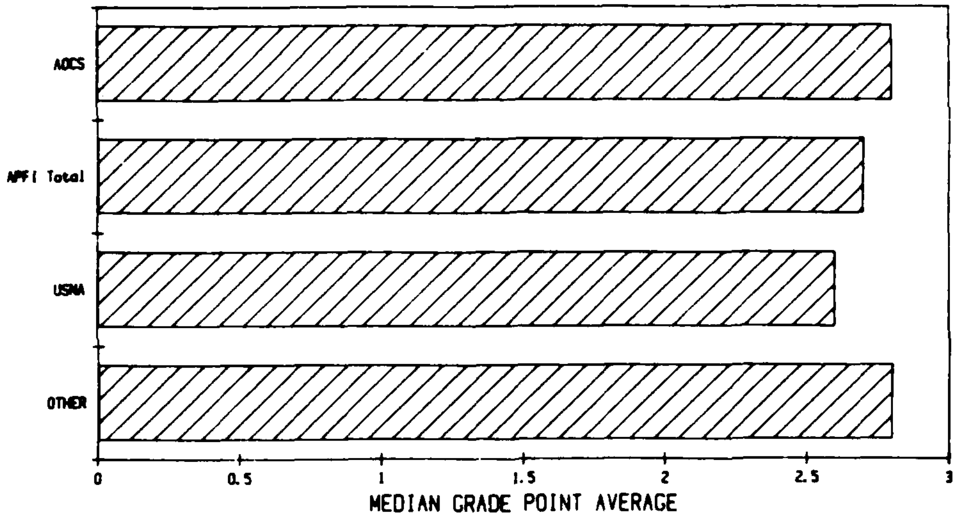


Figure 5.14
CLASS RANK BY ACCESSION SOURCE

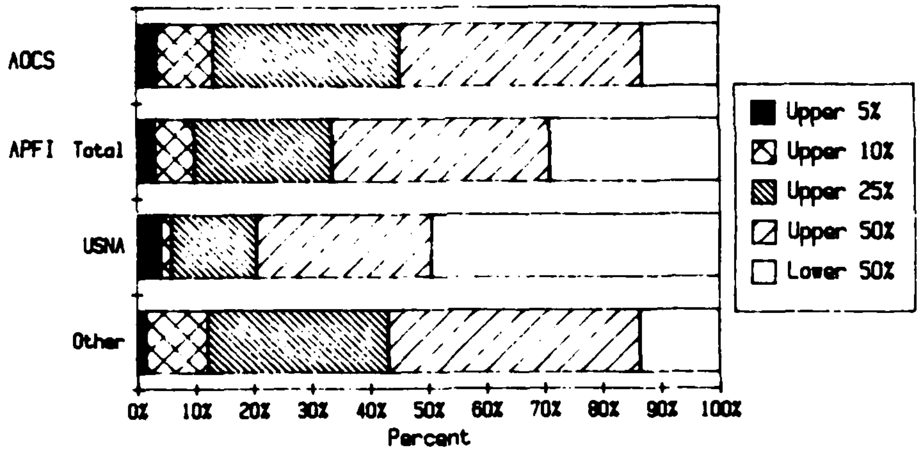
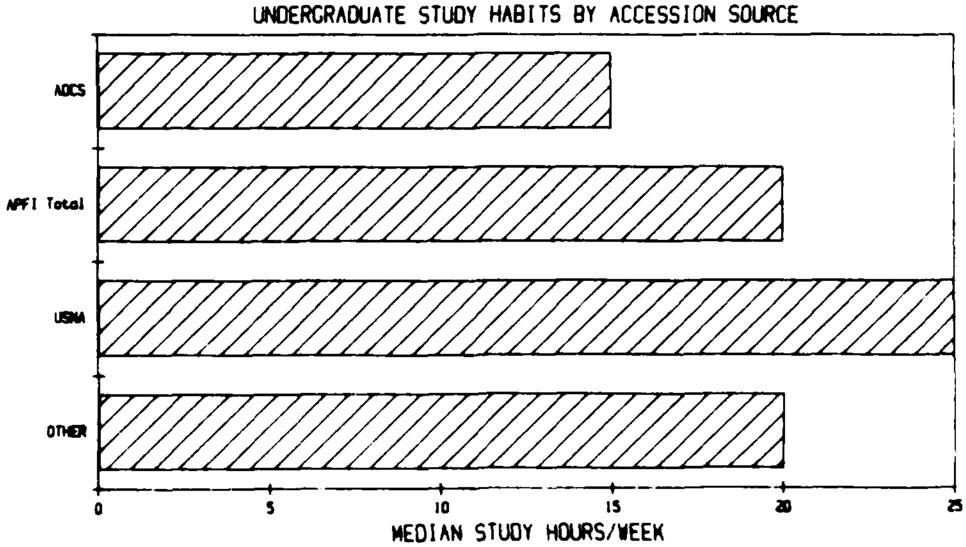


FIGURE 5.15
UNDERGRADUATE STUDY HABITS BY ACCESSION SOURCE



5.3.4 ACADEMIC SKILLS AND TRAINING (*Figures 5.16-5.20*): A large majority of both AOCS accessions (69.4%) and APFI accessions (81.3%) have taken three or more *physical science courses* (Figure 5.16); an even larger majority of AOCS (80.8%) and APFI (94.2%) accessions have taken three or more *mathematics courses* (Figure 5.17); slightly more than one-third of AOCS (40.4%) and APFI (35.8%) accessions have taken three or more *computer-related courses* (Figure 5.18); significantly more APFI accessions (65.8%) than AOCS accessions (31.4%) have taken three or more *engineering courses* (Figure 5.19); and, somewhat fewer APFI (11.1%) than AOCS (17.5%) accessions have had three or more courses in aviation or aeronautics, although the AOCS rate is approached by USNA accessions, fifteen percent of whom have had three or more *aviation or aeronautics courses* (Figure 5.20).

Overall, these patterns reflect the strong technical emphasis of the U.S. Naval Academy curriculum. Nevertheless, as noted earlier, naval aviation training also attracts a sizable share of the civilian male college-educated population who have significant technical training in a variety of specialties.

Figure 5.16
NUMBER OF PHYSICAL SCIENCE COURSES BY ACCESSION SOURCE

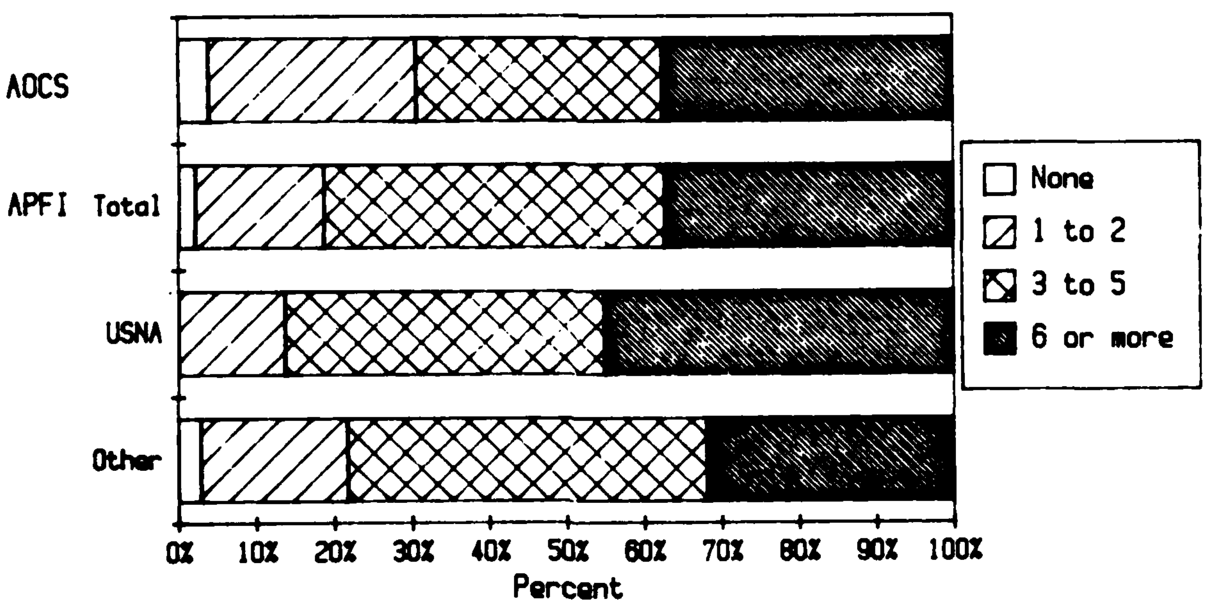


Figure 5.17
NUMBER OF MATH/STAT COURSES BY ACCESSION SOURCE

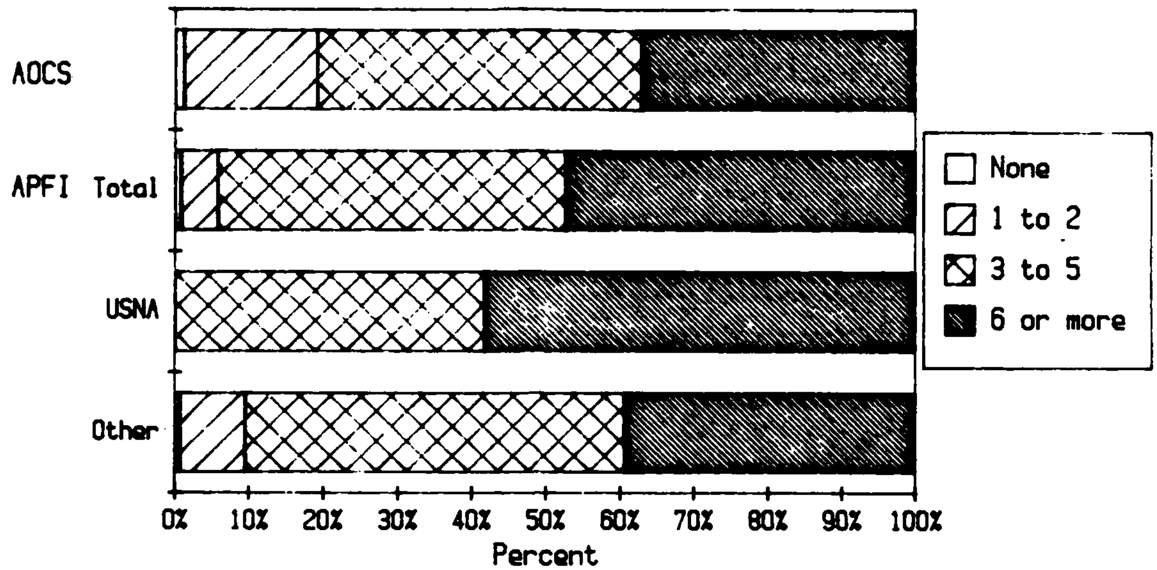


Figure 5.18
NUMBER OF COMPUTER/INFO SCIENCE COURSES
BY ACCESSION SOURCE

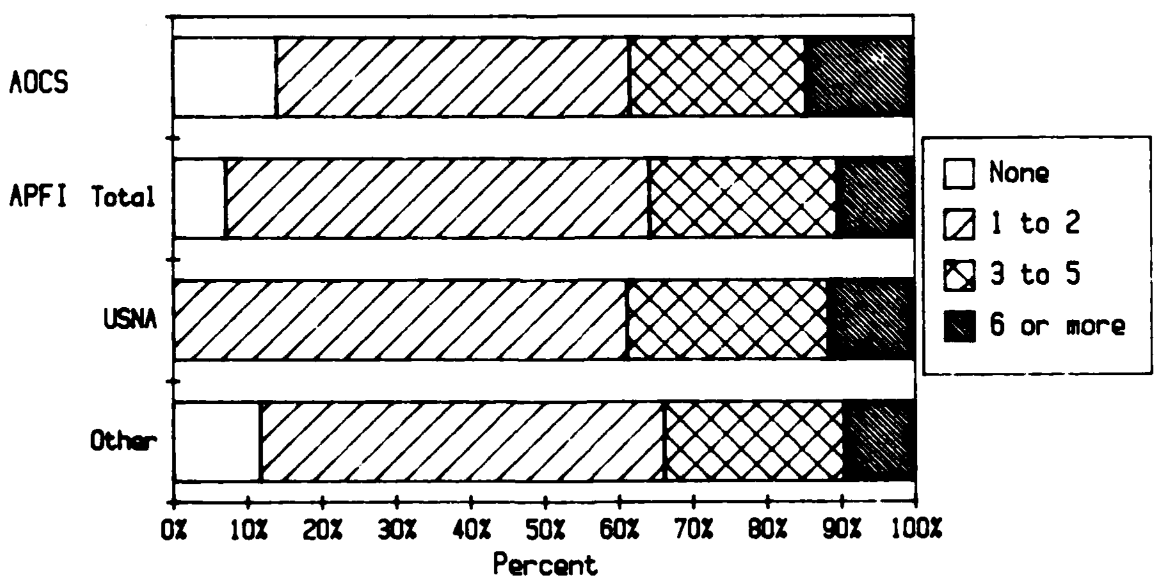


Figure 5.19
NUMBER OF ENGINEERING COURSES BY ACCESSION SOURCE

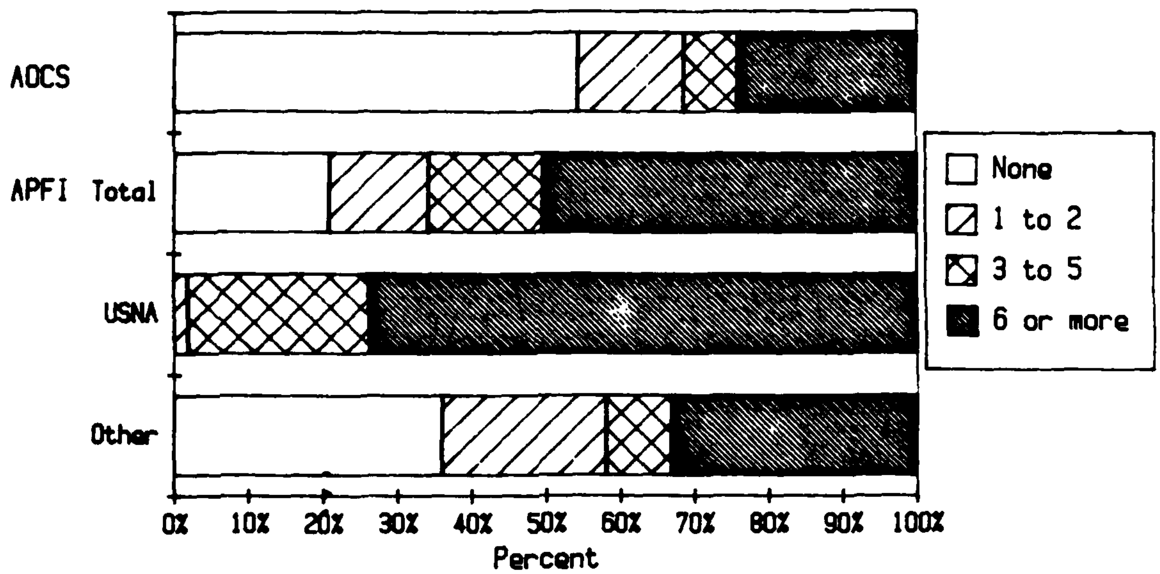
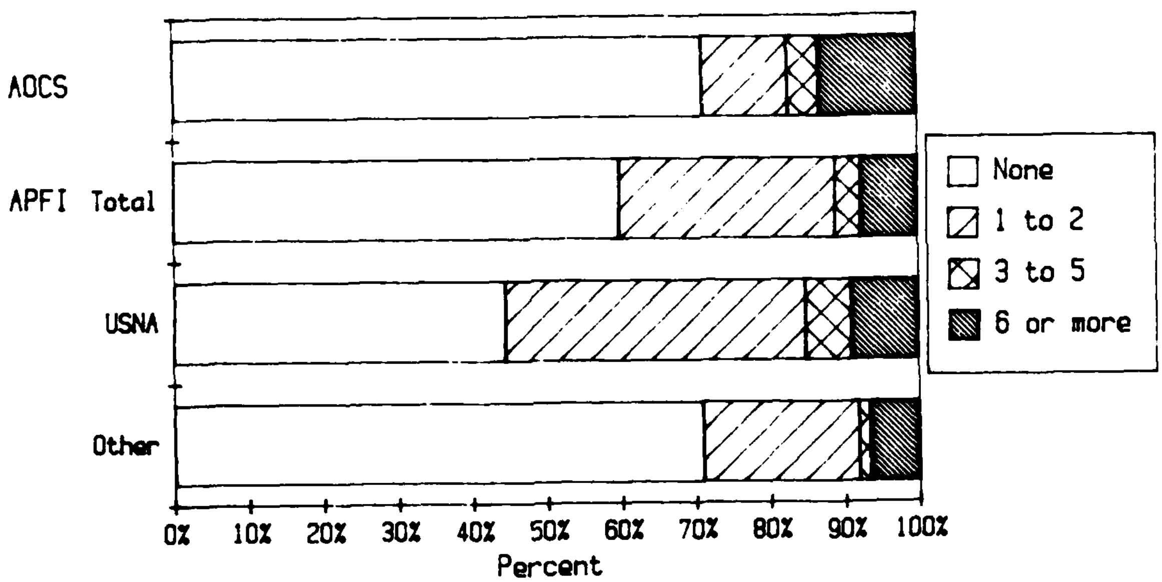
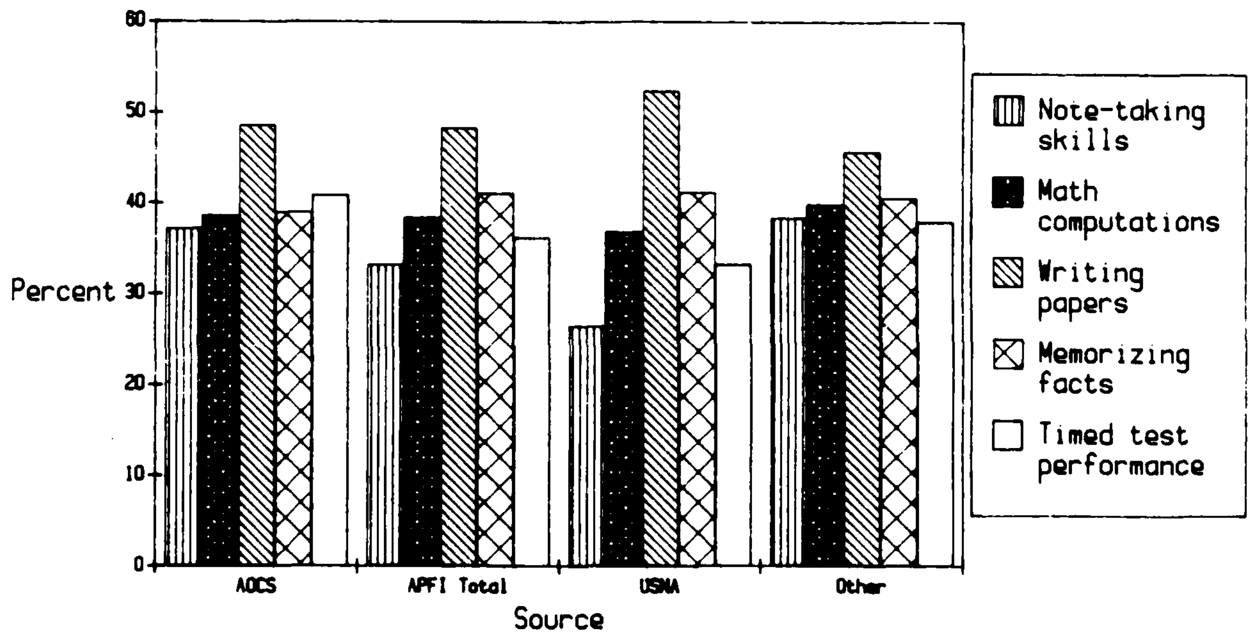


Figure 5.20
NUMBER OF AERONAUTICS/AVIATION COURSES
BY ACCESSION SOURCE



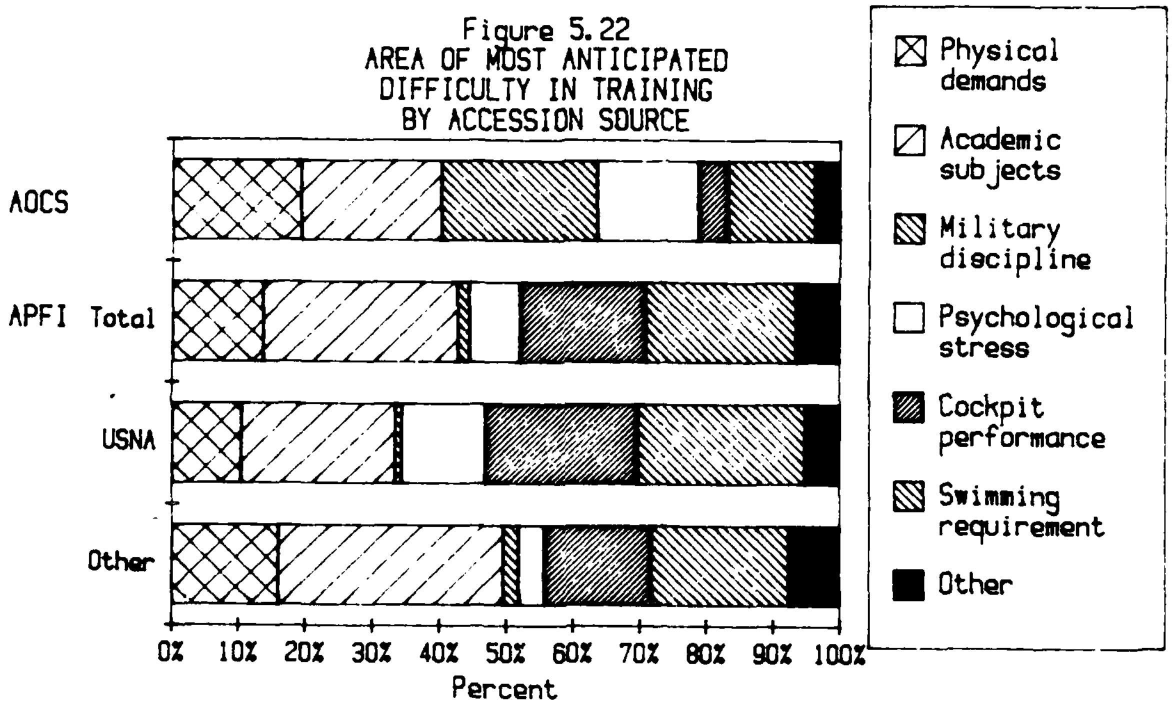
5.3.5 SPECIFIC ACADEMIC COMPETENCIES (*Figure 5.21*): Student Naval Aviator accessions were asked to rate themselves on several specific skills related to performance in educational and training contexts. Roughly one-third of both AOCS (37.2%) and APFI (33.2%) accessions rated themselves as above average in *note-taking skills*, although USNA accessions (26.5%) were less likely to rate themselves high on this specific skill. Approximately one-half of both AOCS (48.6%) and APFI (48.3%) accessions rated themselves as above average in *mathematical skills*. About two of five AOCS and APFI accessions rated themselves above average in *writing skills* (38.6% and 38.4%, respectively), *memorization ability* (39% and 41.1%, respectively), and performance on *timed tasks* (40.9% and 36.2%, respectively). Clearly the highest self-rated competency is in the quantitative domain (mathematical skills) and is related to both individual aptitude and extensive prior training in computationally-oriented technical fields among NASC accessions in general (e.g., the zero-order correlations between self-rated competencies in mathematical skills and amount of coursework in computationally-oriented courses are .24 for physics, .30 for computer sciences, .30 for engineering, and .40 for mathematics).

Figure 5.21
PERCENT ABOVE AVERAGE ON SELECTED ACADEMIC COMPETENCIES BY ACCESSION SOURCE



5.3.6 ANTICIPATED DIFFICULTIES IN TRAINING (*Figure 5.22*): Student Naval Aviators were asked to identify the *one area of aviation training in which they expected to have the most difficulty*. As one might expect based on the prior preparation of AOCS and APFI accessions, and differences in the training requirements of the AOCS and APFI program, Figure 5.22 reveals a number of differences in areas of anticipated difficulty between the two groups.

Figure 5.22
AREA OF MOST ANTICIPATED
DIFFICULTY IN TRAINING
BY ACCESSION SOURCE



Slightly more AOCS (19.3%) than APFI (13.7%) accessions anticipate difficulty in meeting the *physical demands* of training. This modest, but significant, difference is likely a function of the more rigorous physical demands of AOCS and, perhaps, better prior physical conditioning among APFI accessions based on their undergraduate training experiences at the U.S. Naval Academy and, to a lesser degree, in NROTC programs or in Marine training.

More APFI accessions (29.1%) -- especially non-USNA accessions (33.6%) -- than AOCS accessions (21%) anticipate having difficulty with their *academic subjects*, even though APFI accessions typically graduated from more selective colleges and have had more technical training than their AOCS counterparts.

Thirteen times as many AOCS accessions as APFI accessions (23.4% v. 1.8%, respectively) anticipate having difficulty adapting to *military discipline*. This pattern reflects differences in the military training requirements of the AOCS and APFI programs as well as differences in prior military training of AOCS and APFI accessions. This pattern may also be attributable, in some measure, to differences in early exposure to military life. Nevertheless, prior training and differences in program requirements stand out as major contributing factors.

Twice as many AOCS accessions (15.1%) as APFI accessions (7.5%) anticipate difficulty adjusting to the *psychological stress* of training. Four times as many USNA graduates (12.5%) as other APFI accessions (3.8%) anticipate difficulties with the psychological stress of aviation training. These gross patterns are difficult to interpret without further analyses.

Four times as many APFI accessions (18.9%) as AOCS accessions (4.5%) anticipate having difficulties with *cockpit performance*. As we note later in this chapter, AOCS accessions are somewhat more likely than APFI accessions to have had previous flying experience which would explain the observed differences.

Finally, twice as many APFI accessions (22.5%) as AOCS accessions (13.1%) anticipate *swimming difficulties*. This difference may be due to the greater availability of information for Commissioned Naval and Marine officers regarding the stringent swimming demands of naval aviation training.

5.3.7 COLLEGE CHARACTERISTICS (*Figures 5.23-5.24*): APFI accessions are more than twice as likely as AOCS accessions (61% vs. 28.6%) to have attended a relatively small college

of five thousand students or less. As might be expected, this AOCS - APFI difference is partly due to the small size of the USNA, but persists even when this group is excluded from the analysis.

As noted earlier and shown in Figure 5.24, APFI accessions (63.2%) typically attend more selective institutions than do AOCS accessions (30.4%). Even when the highly selective U.S. Naval Academy is excluded more than one of three AOCS accessions as compared to one of five APFI accessions graduated from the least selective colleges and universities. The median Scholastic Aptitude Test (SAT) score of entering freshmen at colleges attended by AOCS accessions is 970 compared to a median SAT score of 1228 for the U.S. Naval Academy and 1017 for colleges attended by other APFI accessions.

Figure 5.23
SIZE OF UNDERGRAD COLLEGE
STUDENT BODY
BY ACCESSION SOURCE

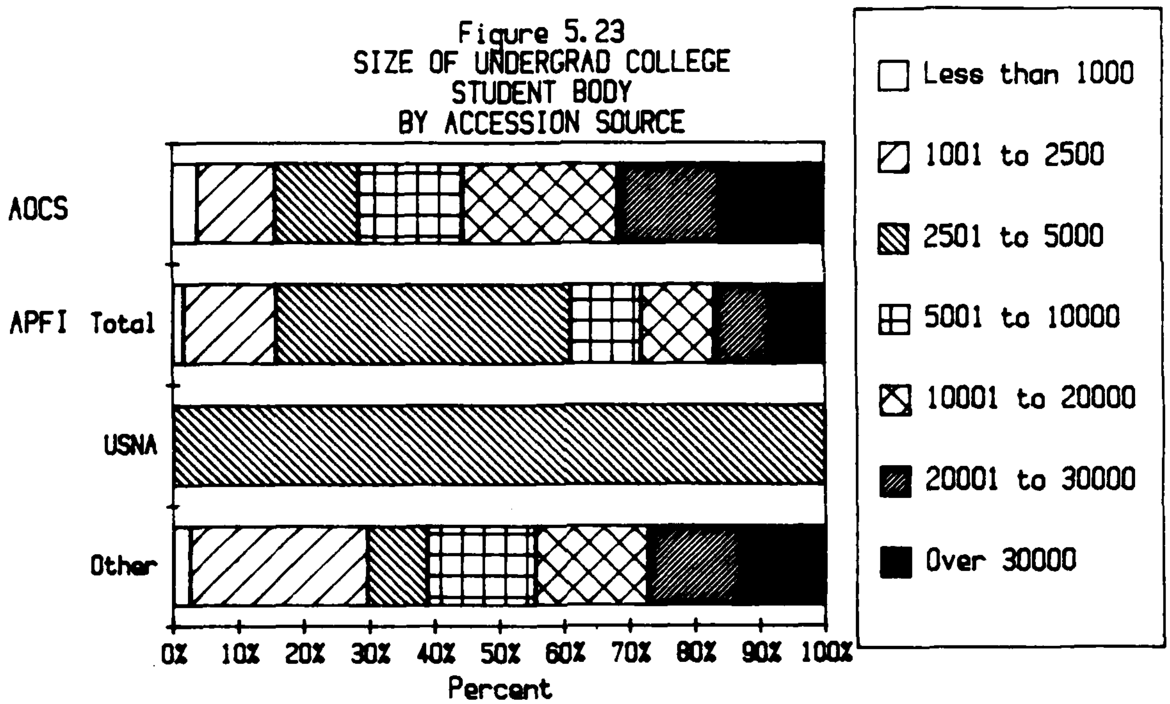
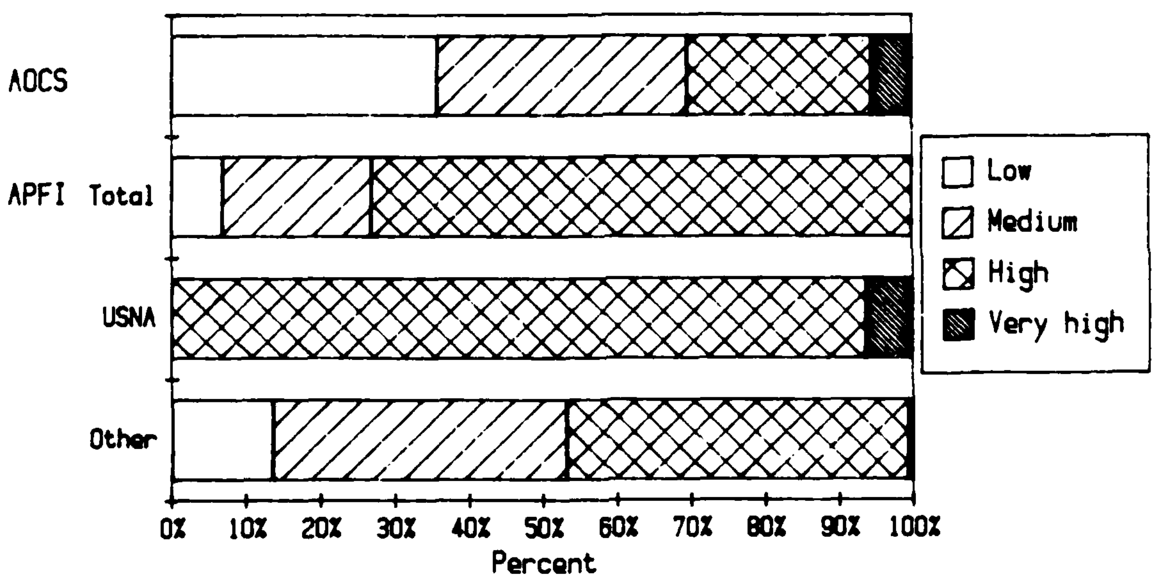


Figure 5.24
SELECTIVITY OF UNDERGRAD COLLEGE
BY ACCESSION SOURCE



5.3.8 UNDERGRADUATE EXTRACURRICULAR PARTICIPATION (Figures 5.25-5.28): Our discussions with naval aviation recruiters revealed that they often take extracurricular involvement into account when assessing a candidate's credentials. Although participation in any one particular extracurricular activity may not obviously relate to a student's performance in naval aviation training, overall rates of extracurricular participation may reveal qualities such as leadership or teamwork which are important attributes in naval aviation training. We report the average number of extracurricularr activities participated in by recent NASC accessions. The rates reported here indicate breadth -- number of activities participated in by the different procurement subgroups. They do not reveal the depth -- intensity -- of involvement, nor do they reveal individual participation patterns that take into account structural or organizational constraints on accessibility to specific types of activities -- e.g., the absence of Greek-letter organizations at the U.S. Naval Academy.

Among AOCS accessions (Figure 5.25), intramural sports (80.9%) by far heads the top-five list of extracurricularr activities most frequently participated in, followed by professional organizations (44%), intercollegiate team sports (31.1%), Greek organizations (30.2%), and service organizations (27.8%). Figure 5.26 shows a similar overall pattern of extracurricularr participation among APFI accessions -- intramural sports (90.5%), followed by intercollegiate team sports (40.3%), service organizations (33.9%), professional organizations (30%), and intercollegiate individual sports (23.2%). Thus, the primary difference in patterns of extracurricularr participation among the major procurement groups is due mainly to the absence of Greek organizations at the U.S. Naval Academy.

The overall rate of extracurricularr particpation is similar for both major procurement sources. Both AOCS and APFI accessions showed a median partcipation rate of 3.00 different activities on a twelve-item extracurricular activity checklist. Among the APFI accession groups USNA graduates show a lower median rate of extracurricularr participation (2.00) than non-USNA graduates (3.00).

Figure 5.25
PERCENT AOCS ACCESSIONS
INVOLVED IN SELECTED COLLEGE
EXTRACURRICULAR ACTIVITIES

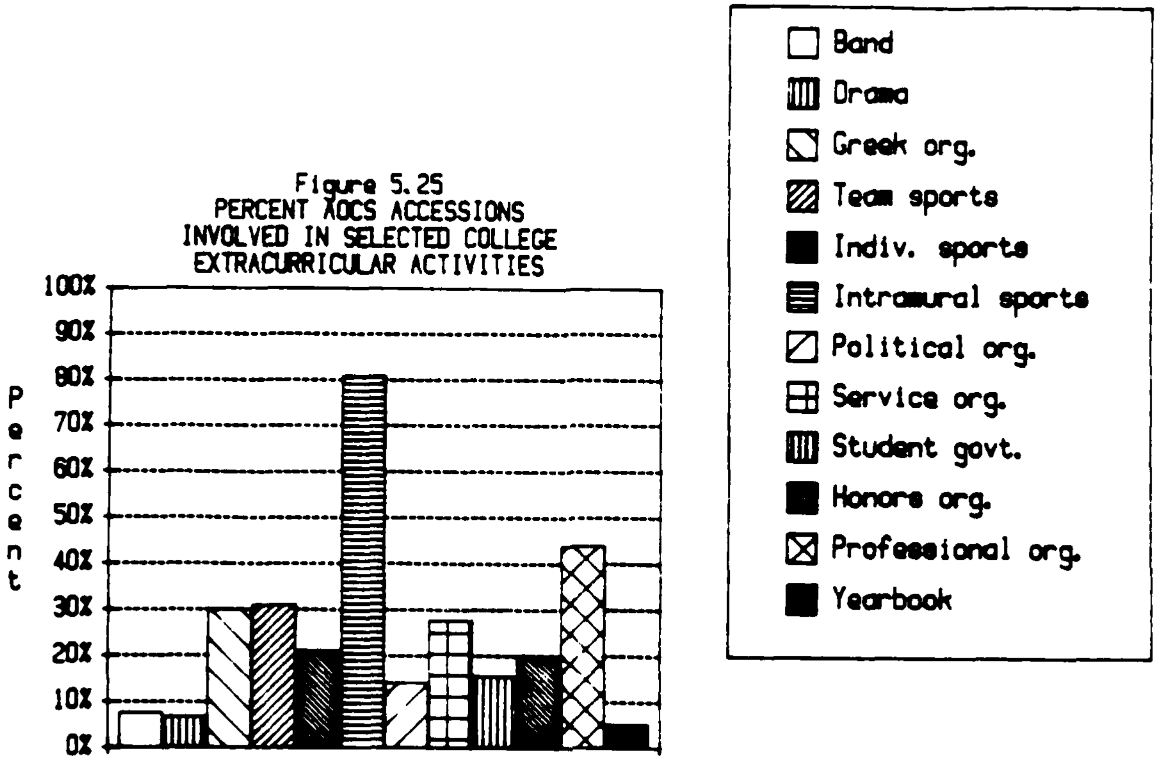
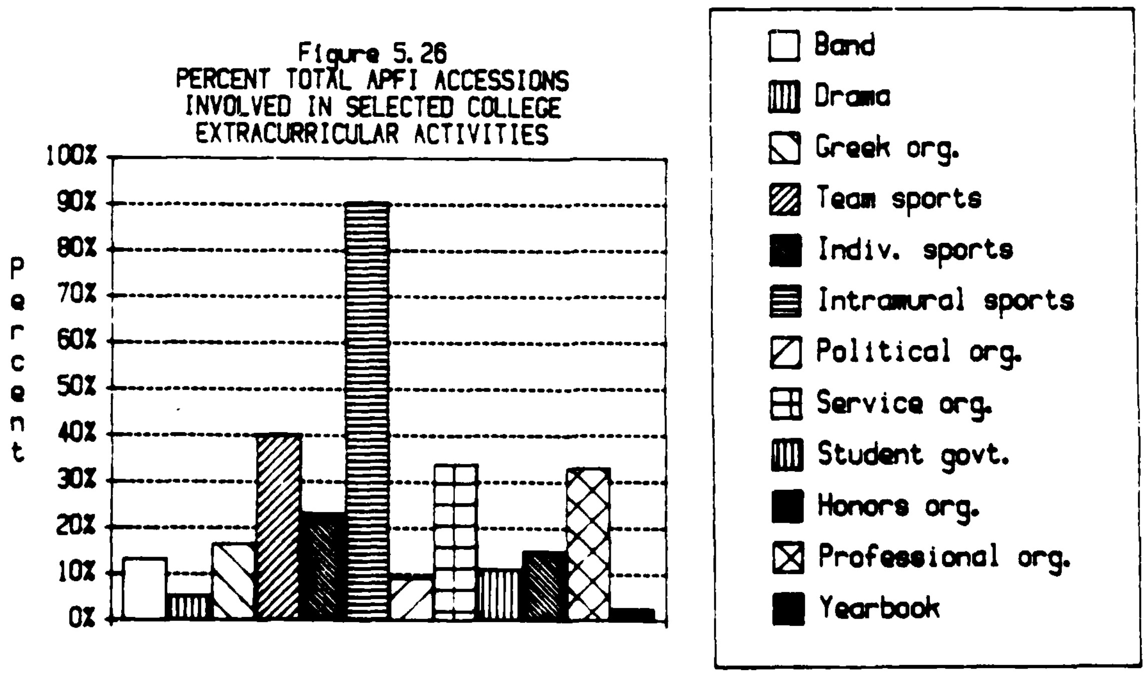


Figure 5.26
PERCENT TOTAL APFI ACCESSIONS
INVOLVED IN SELECTED COLLEGE
EXTRACURRICULAR ACTIVITIES



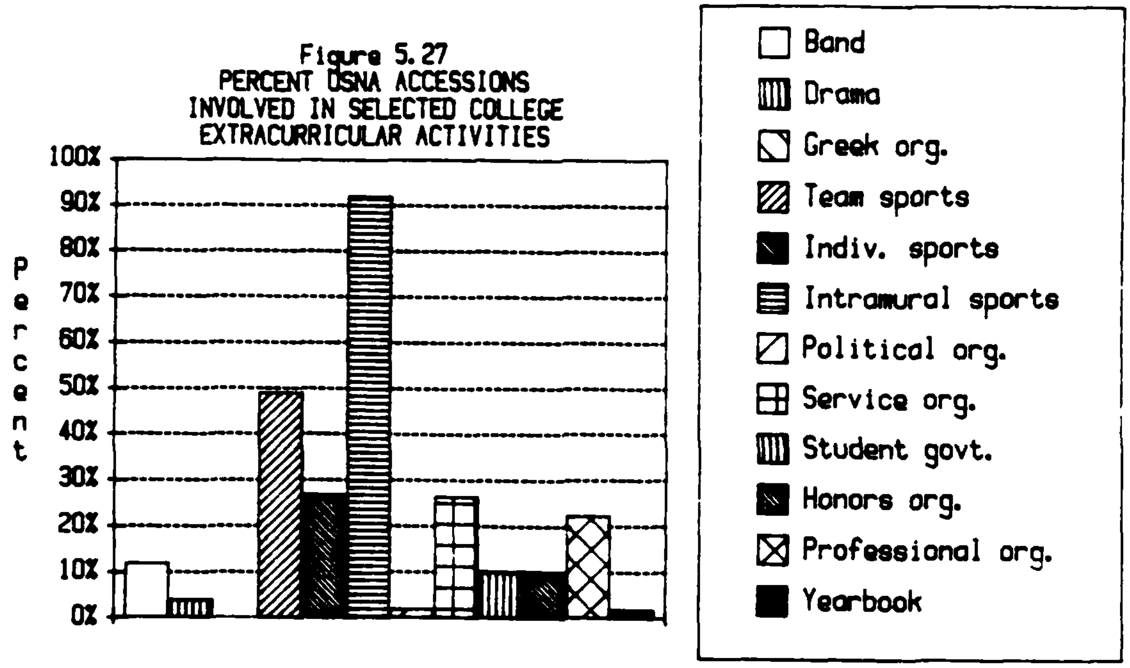


Figure 5.27
PERCENT USNA ACCESSIONS
INVOLVED IN SELECTED COLLEGE
EXTRACURRICULAR ACTIVITIES

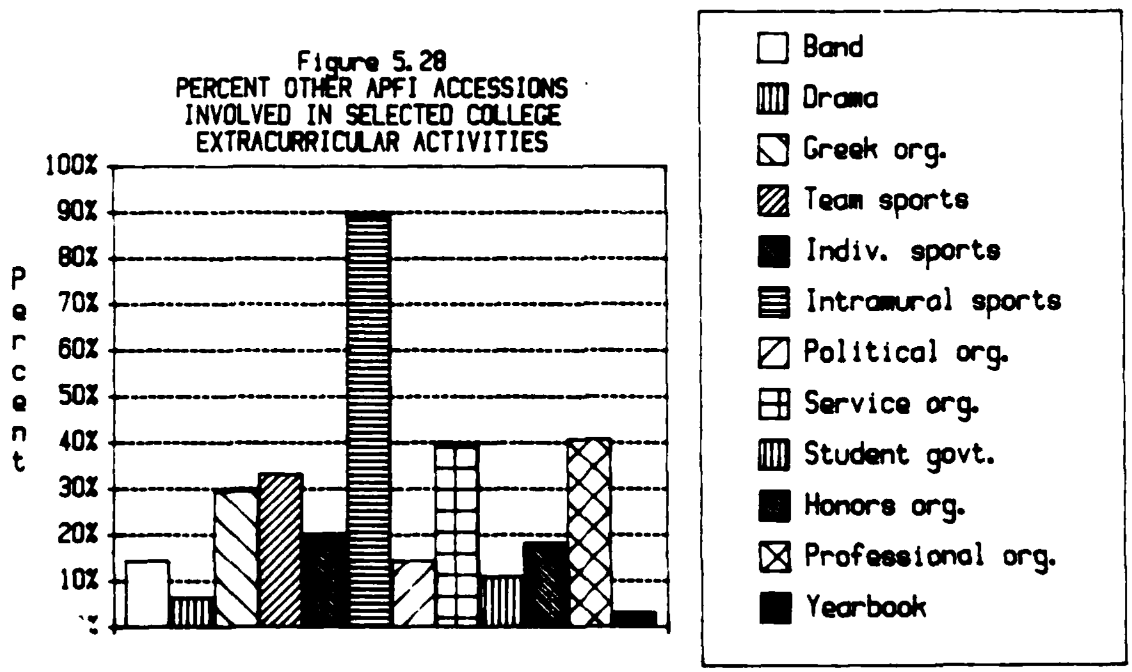


Figure 5.28
PERCENT OTHER APFI ACCESSIONS
INVOLVED IN SELECTED COLLEGE
EXTRACURRICULAR ACTIVITIES

5.4 MILITARY-AVIATION BACKGROUND AND PREPARATION

Figures 5.29 to 5.30 present a descriptive profile of military and aviation exposure, experiences, and orientations of Student Naval Aviators.

5.4.1 MILITARY EXPOSURE (*Figures 5.29-5.30*): APFI accessions as compared to AOCS accessions are slightly, but only marginally significantly more likely to have parents with service experiences in the Navy (32.6% v. 27.0%; Chi Square =2.89; df=1; $p<.10$). APFI accessions are also marginally significantly more likely than AOCS accessions to have relatives with service in some branch of the military (62.8% v. 55.8%; Chi Square = 3.67; df=1; $p<.10$). Thus, for APFI accessions, both Naval and other types of U.S military service represent a family business somewhat more often than is the case for AOCS accessions.

FIGURE 5.29
PARENTS SERVICE BACKGROUND BY ACCESSION SOURCE

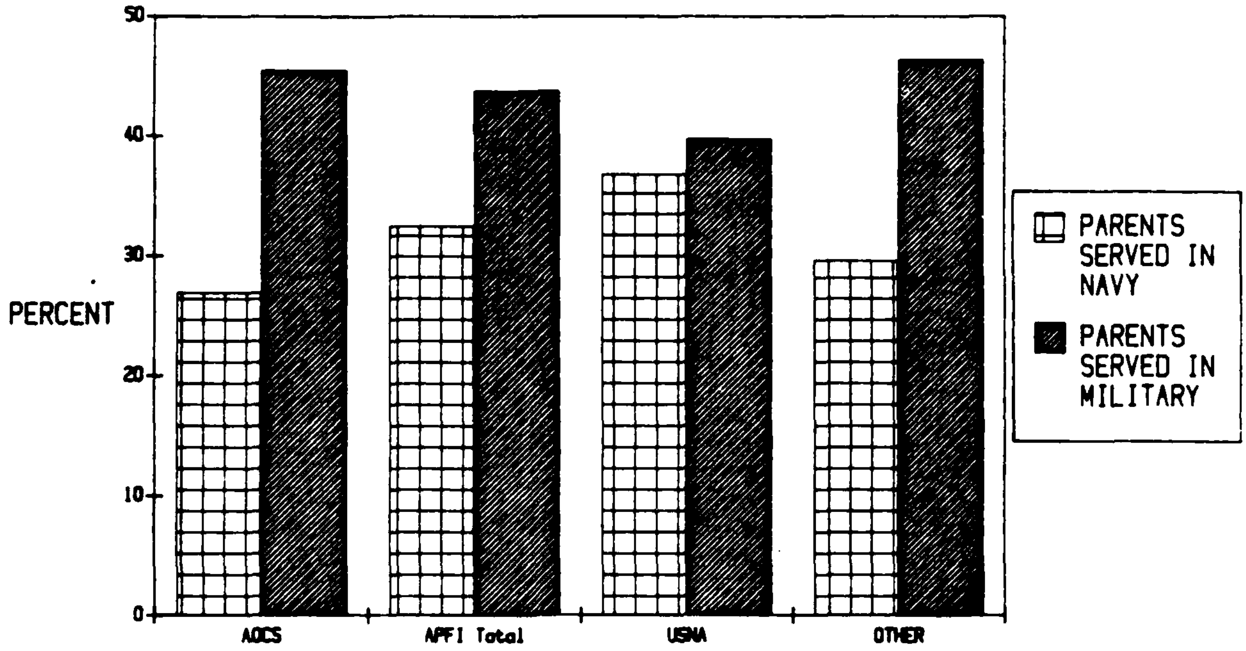
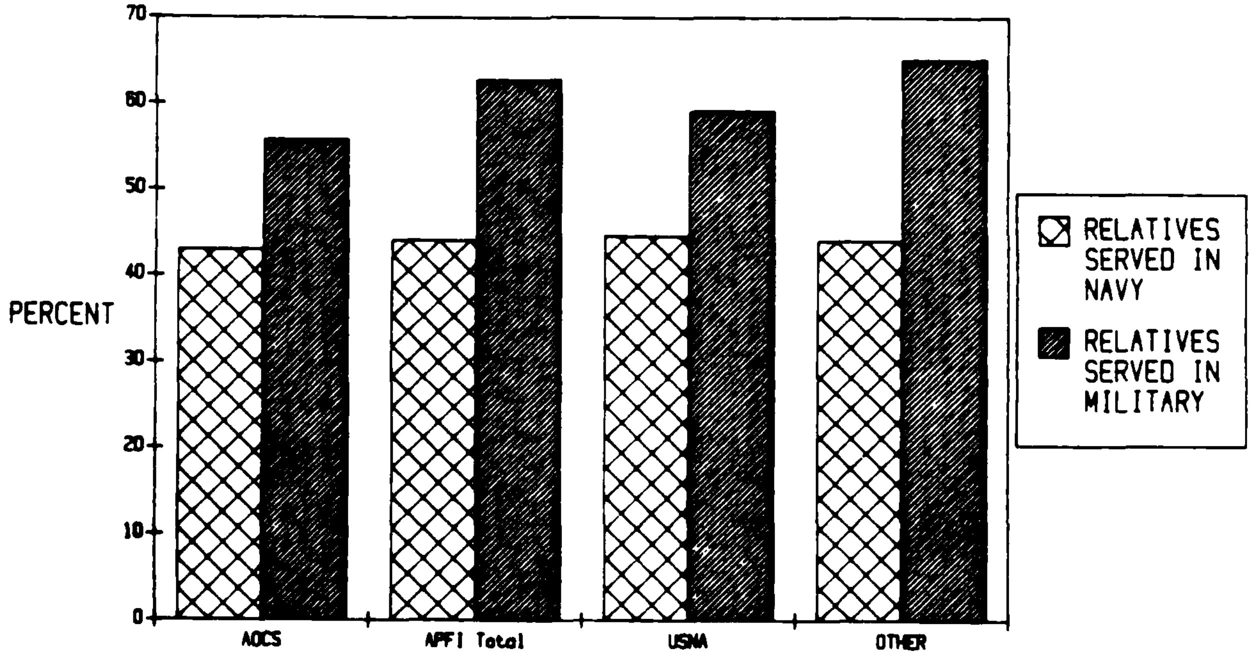


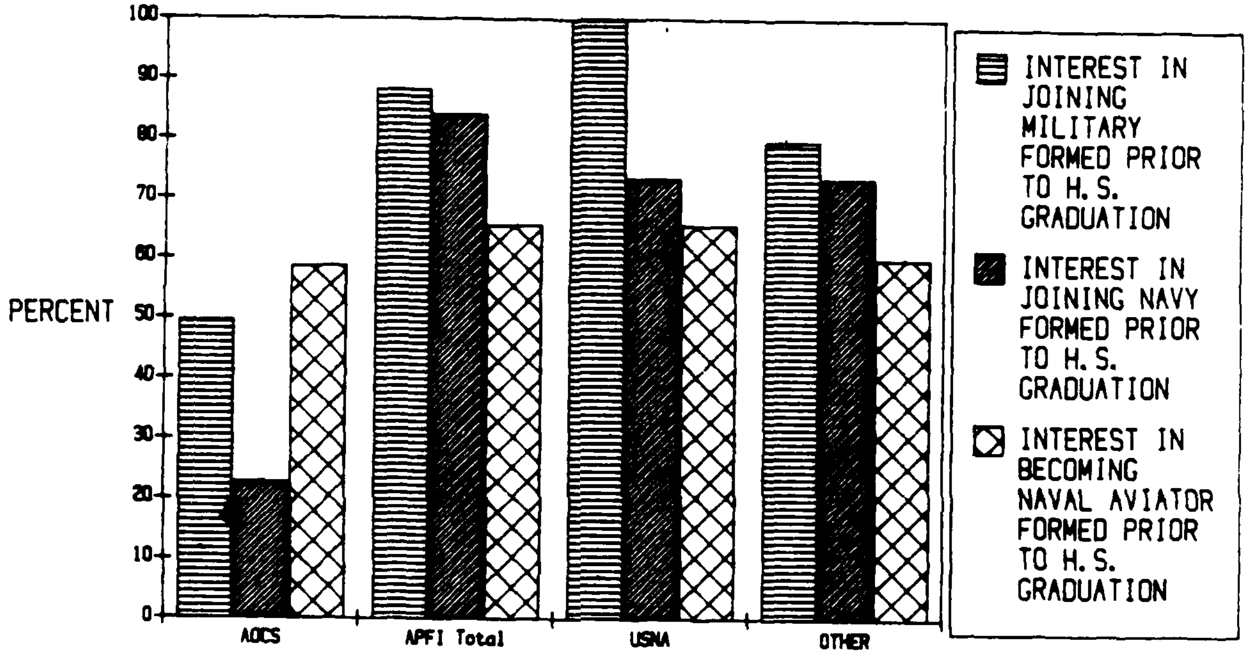
FIGURE 5.30
FAMILYS' MILITARY BACKGROUND BY ACCESSION SOURCE



5.4.2 EARLY MILITARY INTERESTS (*Figure 5.31*): Although the pattern is strongest for graduates of the U.S. Naval Academy, APFI accessions overall (88.4%), as compared to AOCS accessions (49.7%), are much more likely to have developed a serious early interest in joining *some branch* of the U.S. Armed Forces -- early in high school or before. APFI accessions are also nearly four times as likely as AOCS accessions to have developed a serious interest in *joining the Navy* early (84.1% v. 22.8%). Again, this relationship is strongest among USNA accessions.

These striking patterns of APFI-AOCS differences in early interest in military/navy careers are consistent with but cannot be fully explained by greater exposure of APFI accessions to the Navy through parents or relatives. The data show that APFI accessions are also marginally significantly more likely than AOCS accessions to have developed a serious early interest in *becoming an aviator* (65.7% v. 58.8%; Chi Square = 3.65; df=1; p<.10). For whatever reasons, APFI accessions are somewhat more likely than AOCS accessions to have established aspirations to pursue military, and more specifically, naval aviation careers at earlier stages of life. Such early aspirations may have led them to acquire the prior academic and other preparation necessary to qualify for entry into the U.S. Naval Academy, NROTC programs, more competitive major fields, and more highly selective colleges.

FIGURE 5.31
EARLY MILITARY INTERESTS BY ACCESSION SOURCE



5.4.3 AVIATION EXPOSURE (*Figures 5.32-5.39*): APFI and AOCS accessions show few differences in prior exposure to military aviation through family members (Figures 5.32-5.35). Although USNA accessions (14.1%) are slightly more likely than AOCS (9.3%) and other APFI accessions (7.0%) to have been exposed to naval aviation through family members, and non-USNA accessions (8.7%) are slightly more likely than USNA (4.1%) or AOCS (4.0%) accessions to have had aviation exposure through family members who served as enlisted air crew, these patterns are unremarkable. However, the pattern for exposure to *civilian* aviation through family members is slightly more dramatic and favors AOCS accessions over APFI accessions (19.2% v. 12.3%). The modest differential in exposure to military aviation through family members, especially the modestly greater military exposure of APFI accessions, is likely one small contributing factor in their earlier development of interest in military aviation careers.

This hypothesis is only indirectly supported by responses of Student Naval Aviators to questions concerning formal and informal influences on their interests in aviation. Figures 5.36 to 5.39 reveal that AOCS accessions were much more likely than APFI accessions to report having been influenced by relatives in civilian aviation (15.9% v. 7.1%) but major differences were not observed in the family military aviation influence patterns among AOCS and APFI accessions generally.

FIGURE 5.32
AOCS ACCESSIONS' EXPOSURE TO AVIATION THROUGH FAMILY MEMBERS

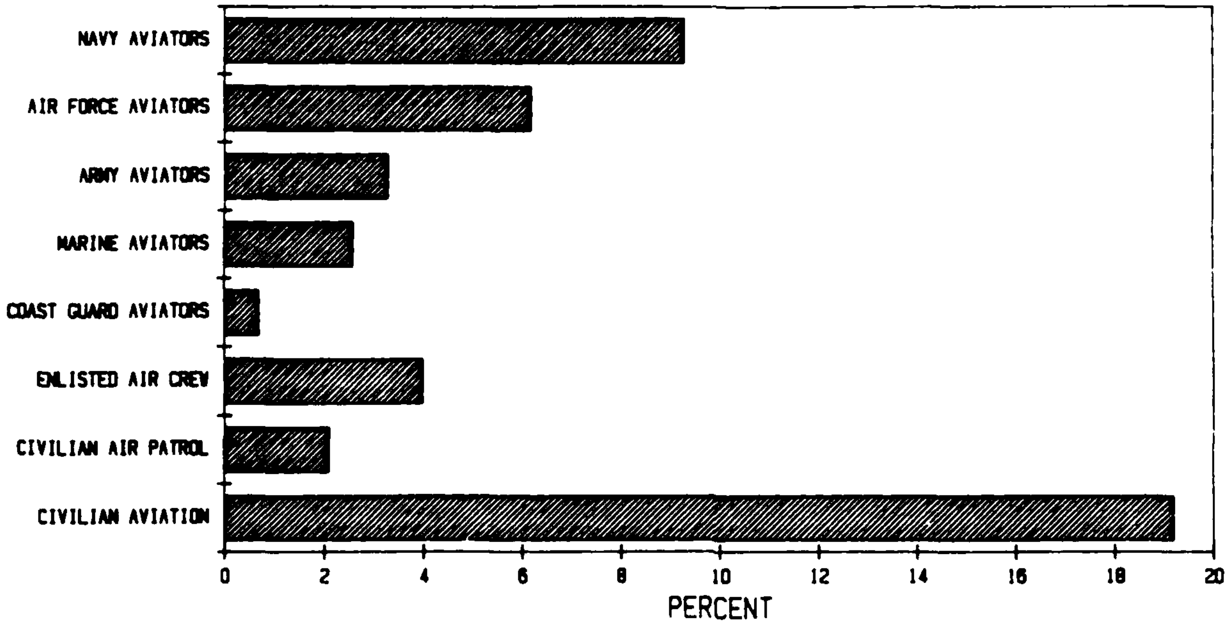


FIGURE 5.33
APFI ACCESSIONS' EXPOSURE TO AVIATION THROUGH FAMILY MEMBERS

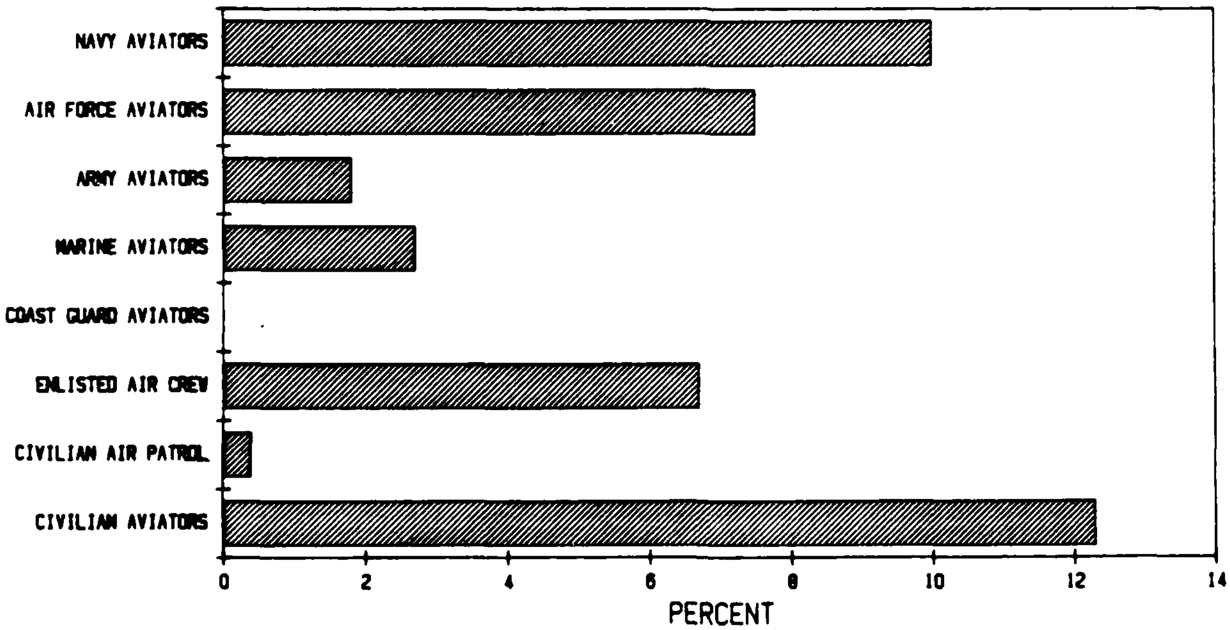


FIGURE 5.34
USNA ACCESSIONS' EXPOSURE TO AVIATION THROUGH FAMILY MEMBERS

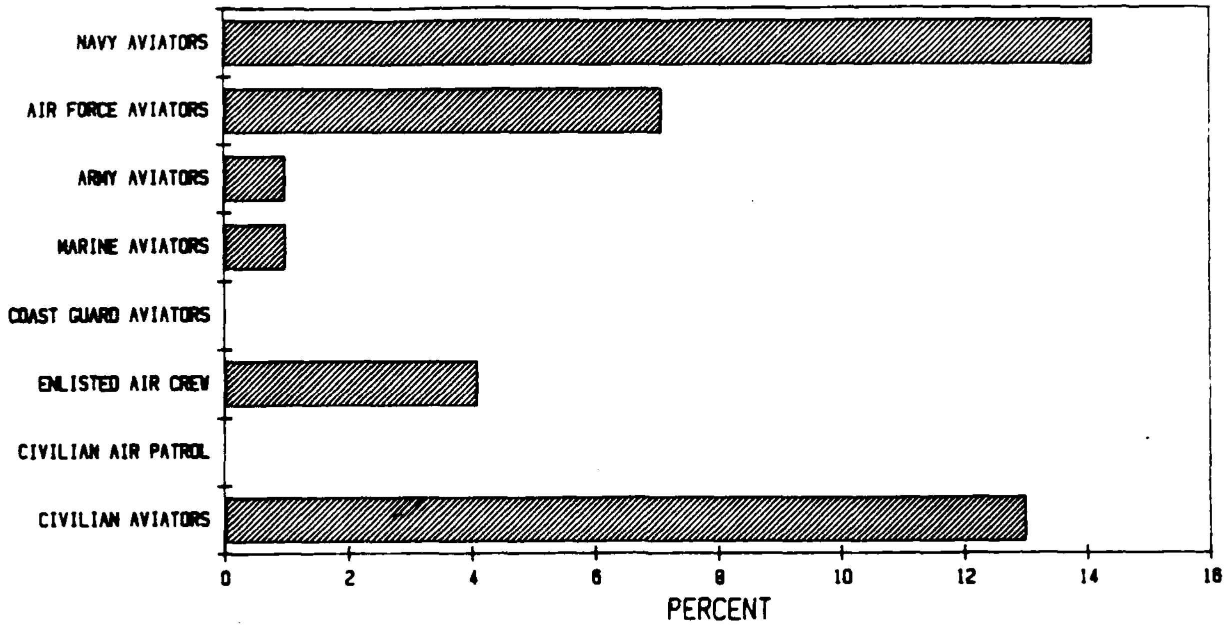


FIGURE 5.35
OTHER APFI ACCESSIONS' EXPOSURE TO AVIATION THROUGH FAMILY MEMBERS

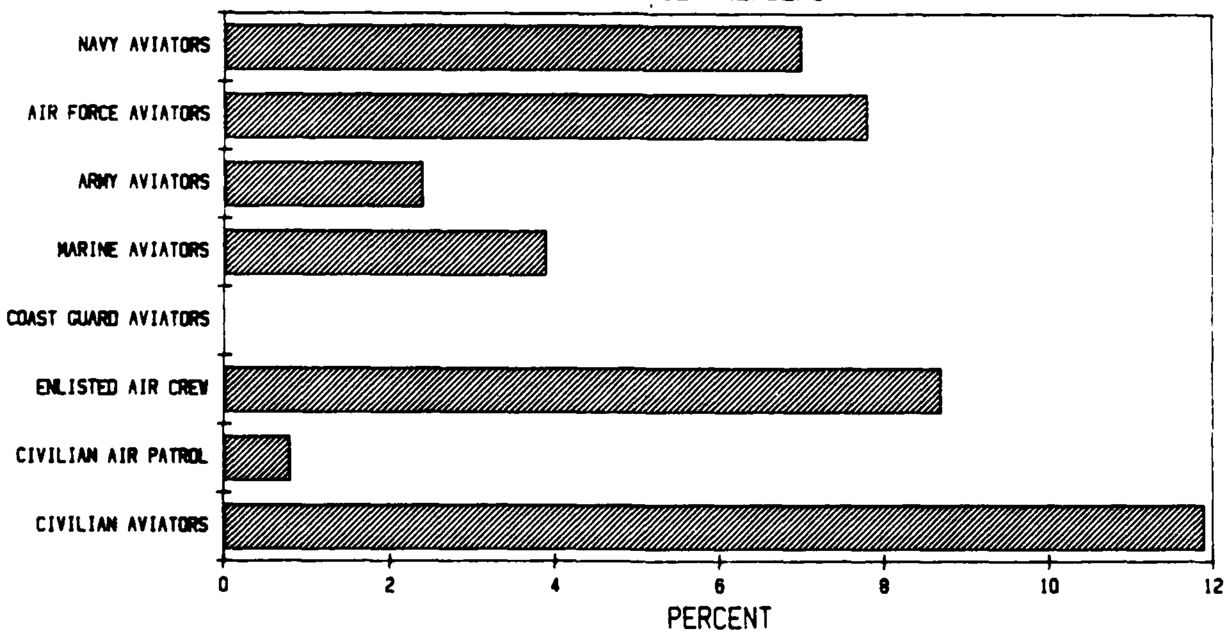


Figure 5.36
INFORMAL INFLUENCES ON AVIATION INTERESTS

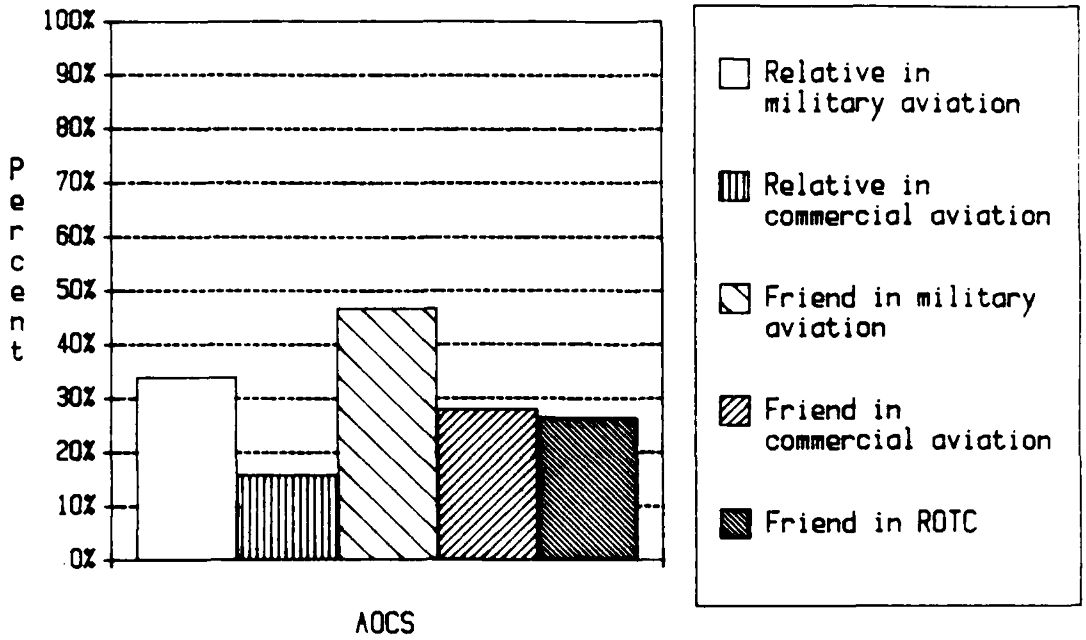


Figure 5.37
INFORMAL INFLUENCES ON AVIATION INTERESTS

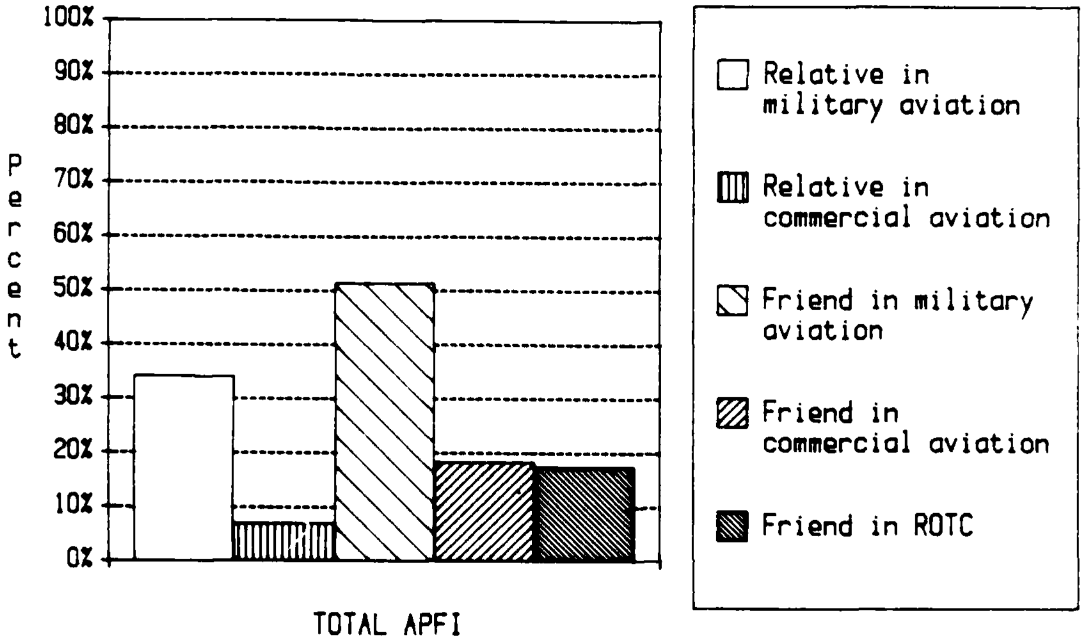


Figure 5.38
INFORMAL INFLUENCES ON AVIATION INTERESTS

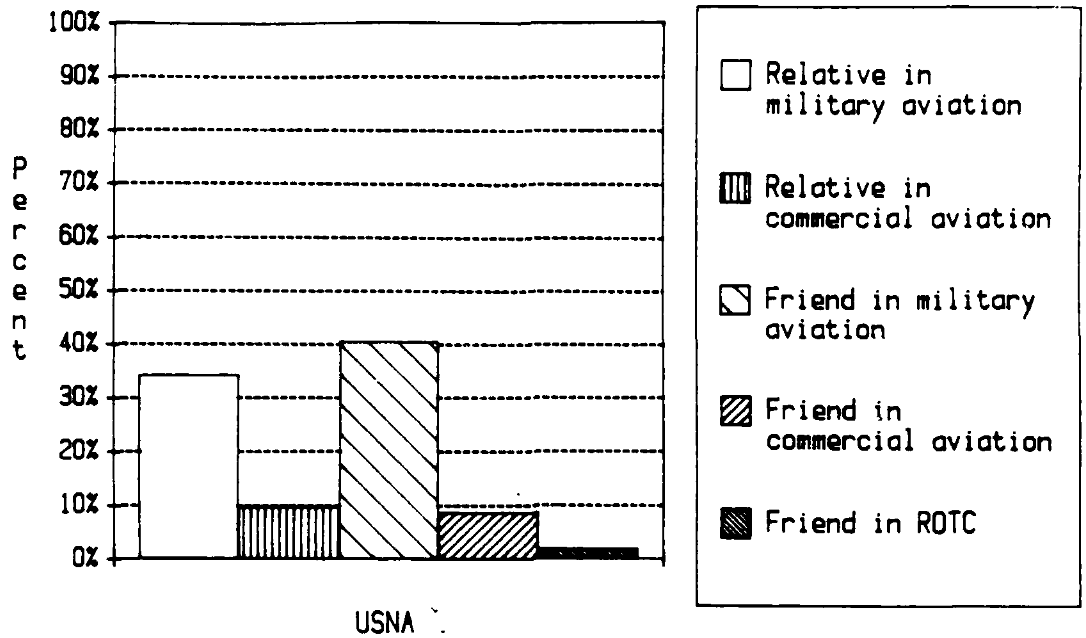
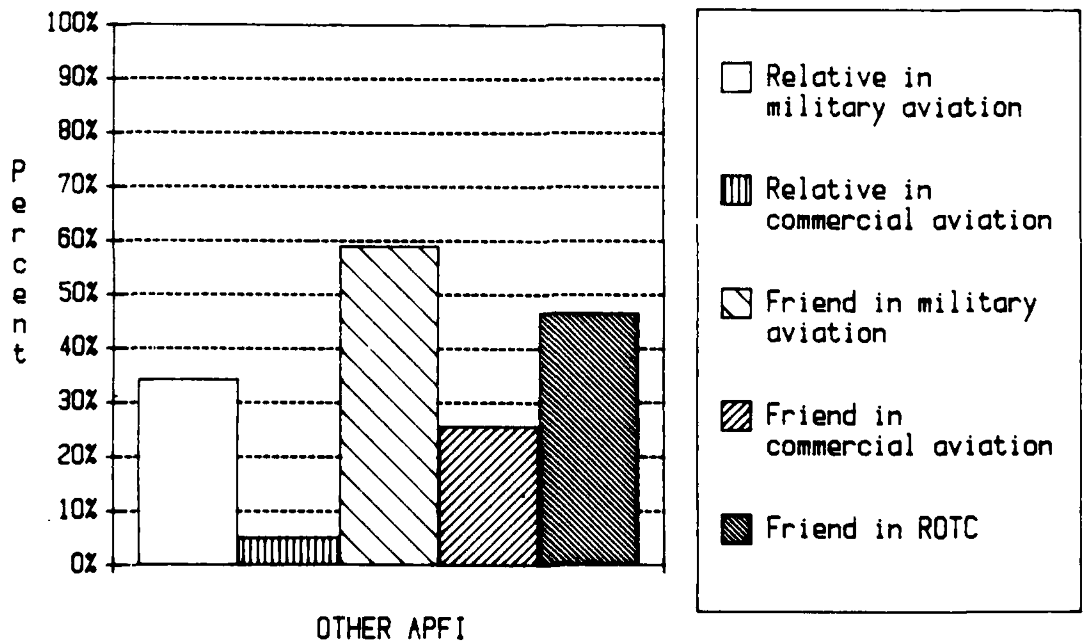


Figure 5.39
INFORMAL INFLUENCES ON AVIATION INTERESTS



5.4.4 EXPOSURE TO FORMAL RECRUITING (Figures 5.40 to 5.43): As would be expected, contacts with *Navy recruiters* had a much stronger influence on the aviation interests of AOCS (68%) than APFI (14.3%) accessions. Similarly, we also find that *media advertising* has a much greater influence on AOCS (64.4%) than APFI (49.0%) accessions. Mass advertising strategies for Naval aviation are primarily designed to reach the college-trained civilian procurement market. In like manner, the targeted efforts of the *Blue and Gold Team* to attract candidates to programs such as the U.S. Naval Academy are reflected in reports of its influence more often among USNA accessions (26.5%) than among AOCS accessions (17%) or other APFI accessions (18.3%). Similar differences in the target populations of the *Blue Angels* are reflected in reports of their influence on the aviation interests of USNA accessions (77.5%) compared to other APFI accessions (58.8%) or to AOCS accessions (61.2%).

Figure 5.40
FORMAL INFLUENCES ON AVIATION INTERESTS

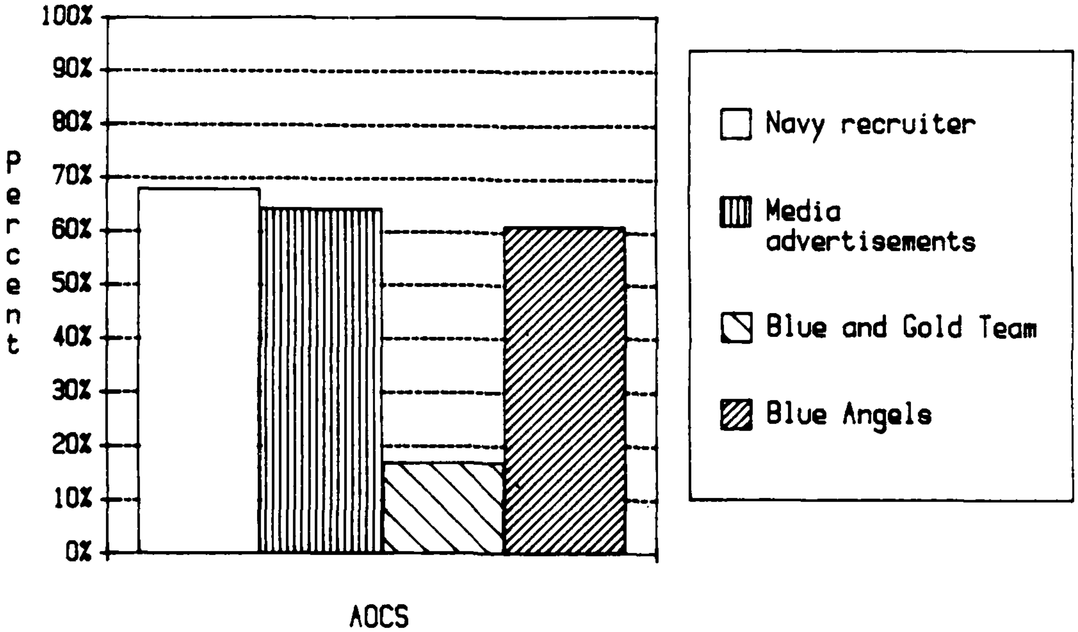


Figure 5.41
FORMAL INFLUENCES ON AVIATION INTERESTS

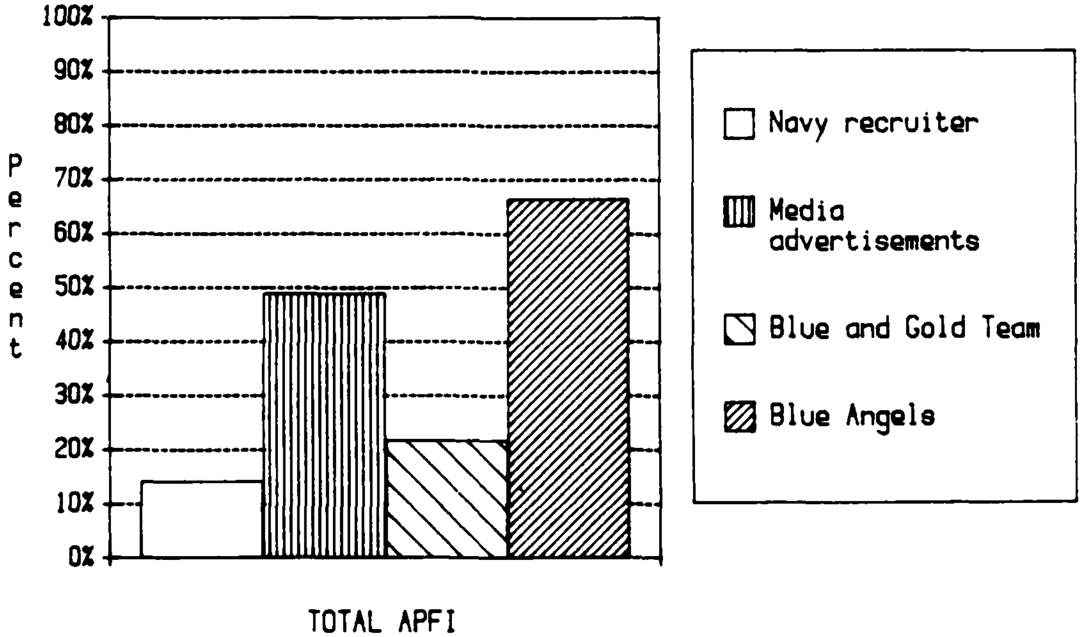


Figure 5.42
FORMAL INFLUENCES ON AVIATION INTERESTS

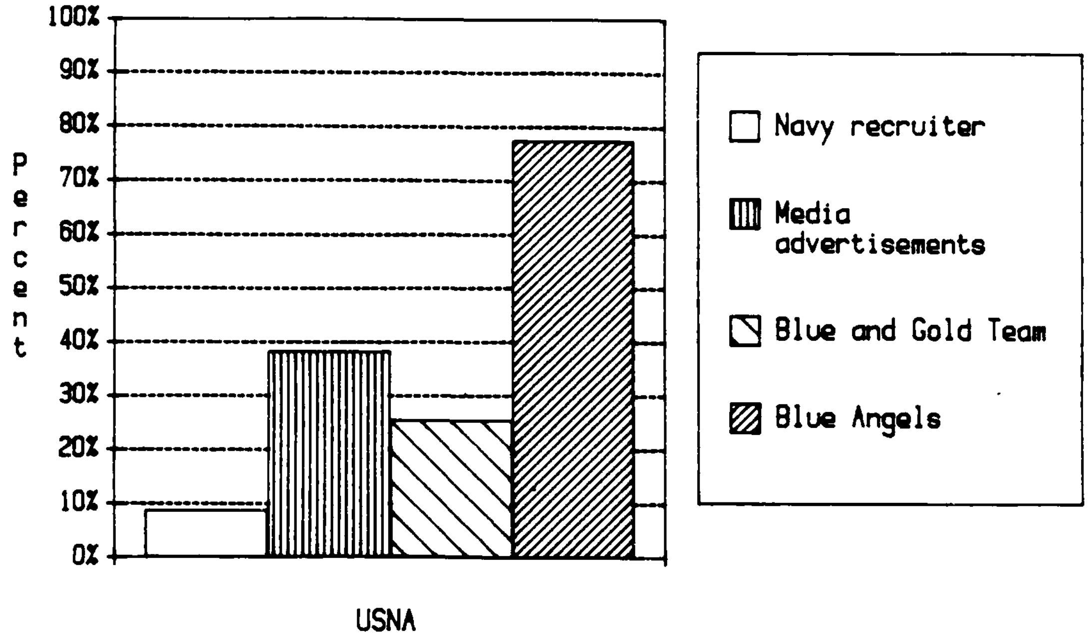
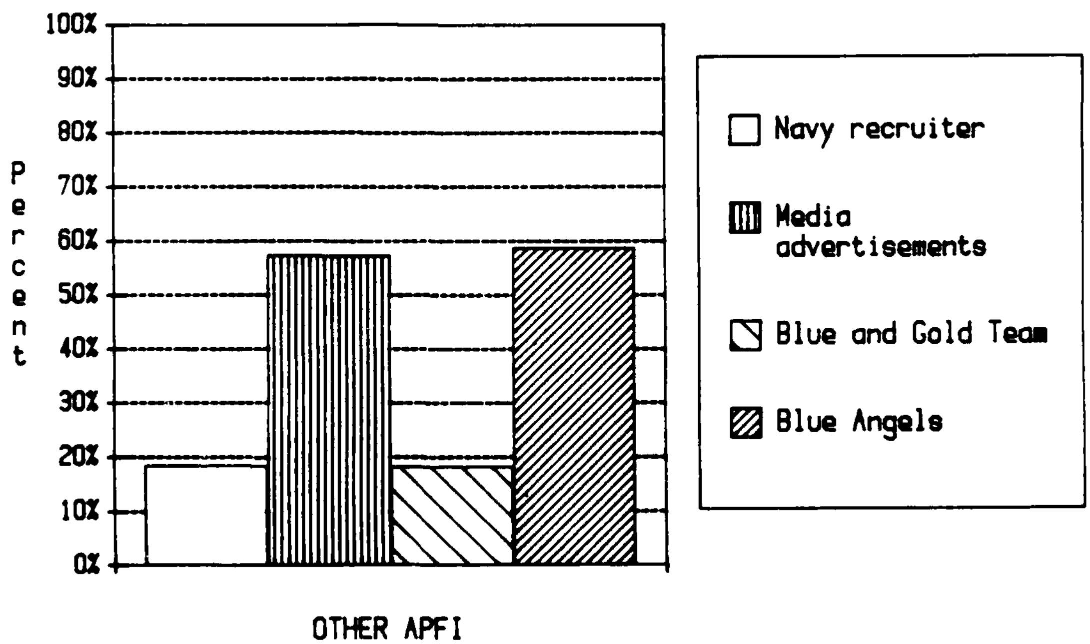


Figure 5.43
FORMAL INFLUENCES ON AVIATION INTERESTS



5.4.5 PREVIOUS FLIGHT EXPERIENCE (Figures 5.44-5.46): As mentioned, AOCS accessions as compared to APFI accessions are more likely to enter naval aviation training with *previous flying experience* (40.7% v. 32.4%). And among Student Naval Aviators with previous flight experience, AOCS accessions are more than twice as likely as APFI accessions (34.4% v. 14.1%) to have earned a *private pilot's license* (Figure 5.45), and to have accumulated somewhat more *flight hours* (Figure 5.46). The median amount of prior flight time is 40 hours for AOCS accessions, compared to 16 hours of prior flight time for APFI accessions. This difference is only marginally significant, however ($t=1.88$; $p<.10$).

Overall, the Navy appears to be attracting significant numbers of Student Naval Aviators who have had previous flying experience.<*> Although the typical accession with previous flying experience has not amassed the 100 hours which some Navy experts believe to be the threshold necessary for a significant and enduring impact on aviation training performance, sizable numbers of Student Naval Aviators may enter training with a potential advantage based on their prior flight experience.

<*> Although not shown here, the mean number of flight hours is considerably higher than the median for both AOCS (mean = 127.68 hrs; S.D.=239.77) and APFI (mean = 87.71 hrs; S.D.=402.23) but the high degree of variation within the groups in the amount of accumulated flight time makes the median more representative of typical group patterns. Both measures reflect similar patterns between AOCS and APFI accessions.

FIGURE 5.44
PRE-FLIGHT EXPERIENCE BY ACCESSION SOURCE

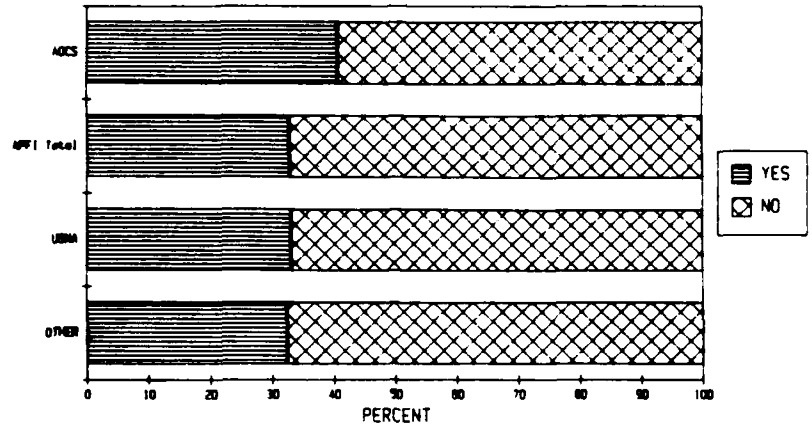


FIGURE 5.45
PRIVATE PILOTS LICENSE BY ACCESSION SOURCE

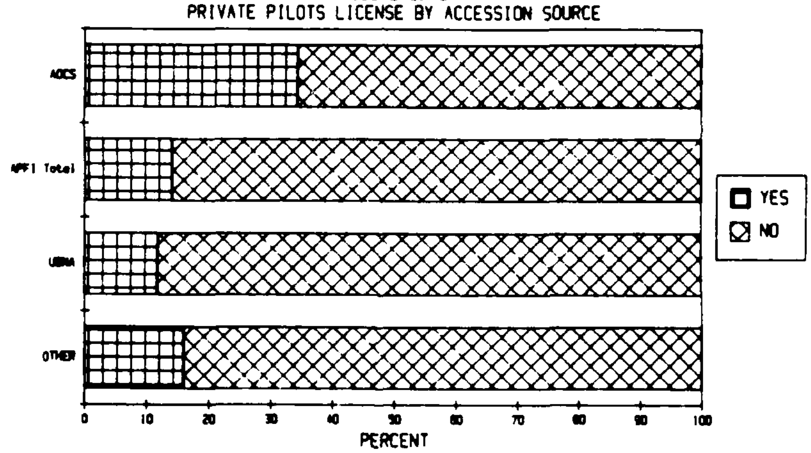
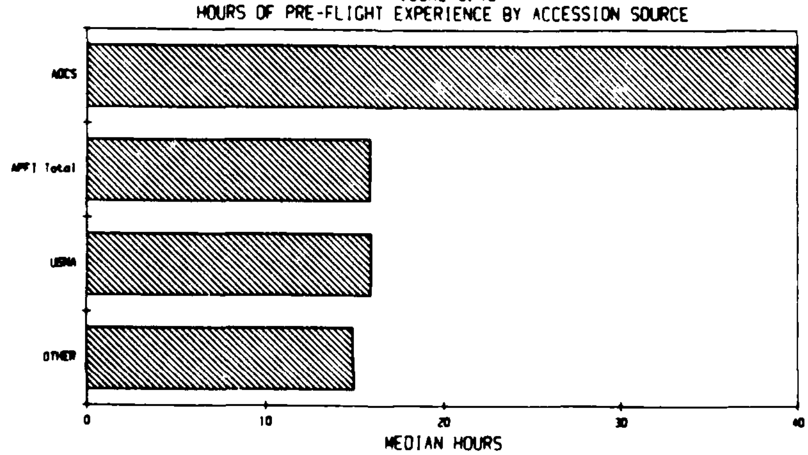


FIGURE 5.46
HOURS OF PRE-FLIGHT EXPERIENCE BY ACCESSION SOURCE



5.4.5 PARTICIPATION in FITNESS AND LEISURE ACTIVITIES (Figures 5.47 - 5.50): As with extracurricular participation, student naval aviator's overall involvement in fitness and leisure activities may represent crude indicators of personal attributes which may be correlated with successful performance in naval aviation training. And although participation in any one particular fitness/leisure activity may not have obvious relevance to a student's performance in naval aviation training, overall fitness/leisure participation patterns may signal a candidate's preparedness for adapting to the rigors of naval undergraduate flight training.

Among AOCS accessions, running (86.1%) by far heads the top-five list of fitness and leisure activities most frequently participated in, followed by swimming (70.8%), weightlifting (52.3%), skiing (46.8%), and tennis/racquetball (46.2%). APFI accessions show a similar pattern of fitness/leisure participation -- running (85.5%) heads the top-five list, followed by swimming (60.3%), weightlifting (45.9%), tennis/racquetball (39.7%), and basketball (36.8%). Thus the primary difference in types of fitness/leisure participation among the major procurement groups involves skiing. (Although basketball did not make the AOCS accessions' top-five list, about the same percentage participate in basketball as do APFI accessions.) However, AOCS accessions are about one-third more likely than APFI accessions to have been involved in skiing (46.8% v. 30.2%) -- due perhaps to differences in time and scheduling flexibility among the two groups. The overall rates of fitness and leisure participation differ among the major procurement groups. Based on responses to a twenty-two item fitness/leisure activity checklist, AOCS accessions showed a higher median participation rate than APFI accessions (six activities v. five activities).

Figure 5.47
PERCENT AOCS ACCESSIONS
REGULARLY INVOLVED IN
SELECTED LEISURE ACTIVITIES

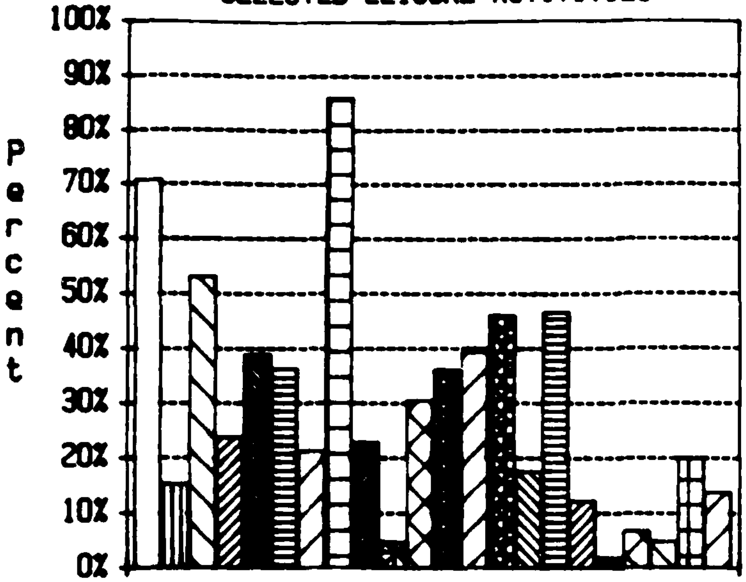


Figure 5.48
PERCENT TOTAL APFI ACCESSIONS
REGULARLY INVOLVED IN
SELECTED LEISURE ACTIVITIES

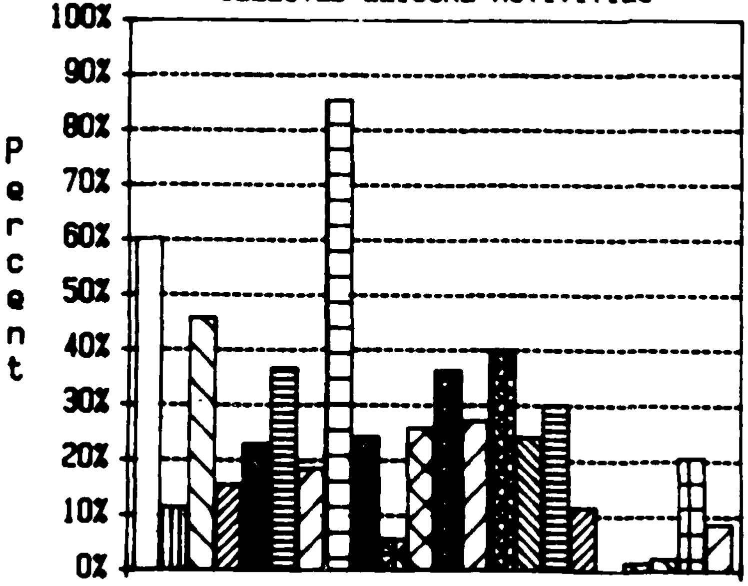


Figure 5.49
PERCENT USNA ACCESSIONS
REGULARLY INVOLVED IN
SELECTED LEISURE ACTIVITIES

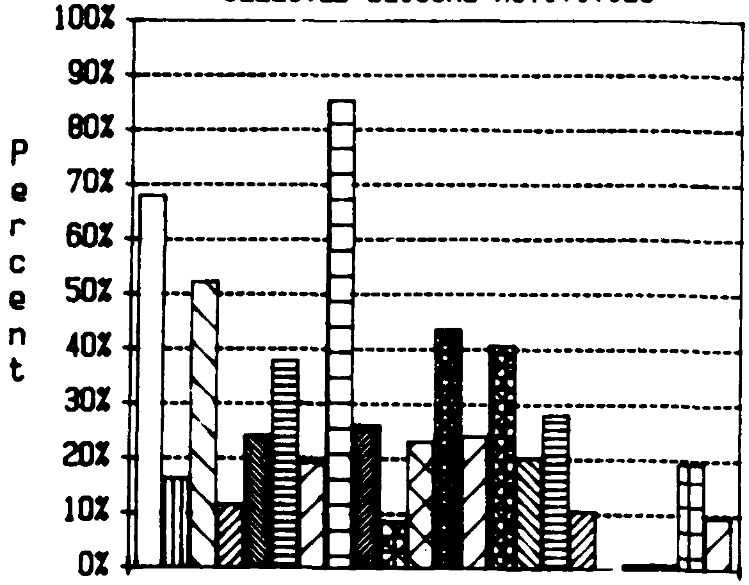
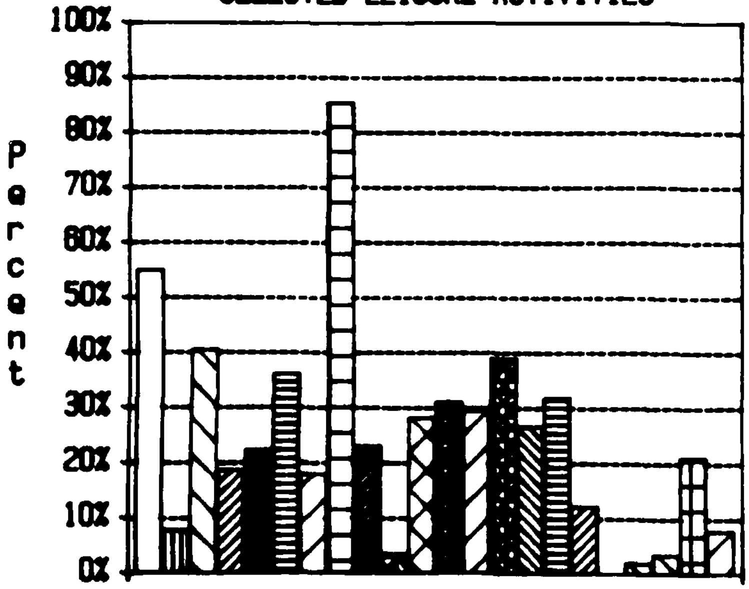
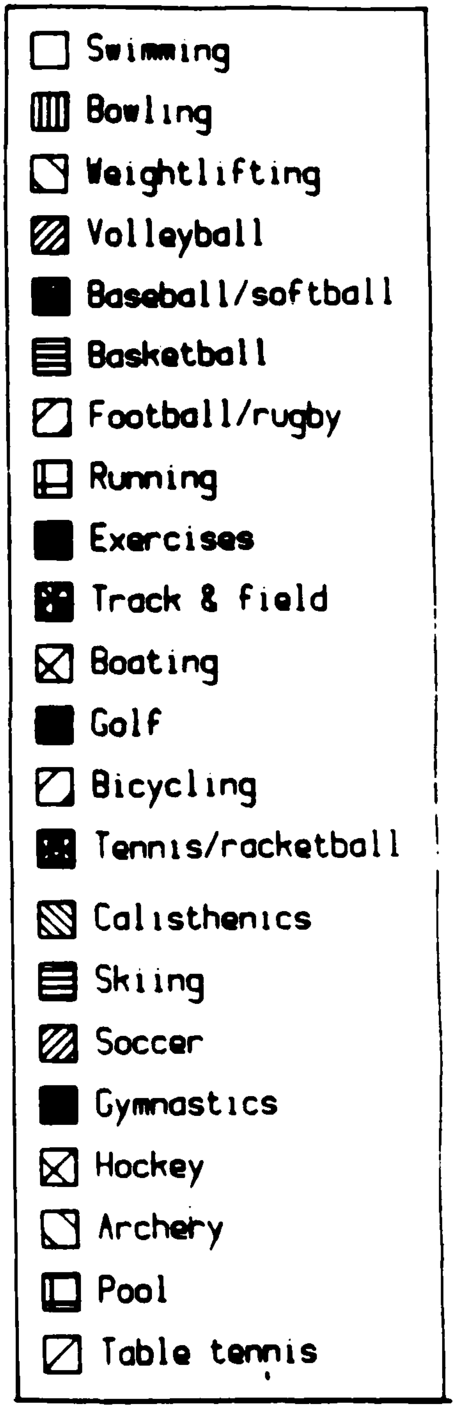


Figure 5.50
PERCENT OTHER APFI ACCESSIONS
REGULARLY INVOLVED IN
SELECTED LEISURE ACTIVITIES





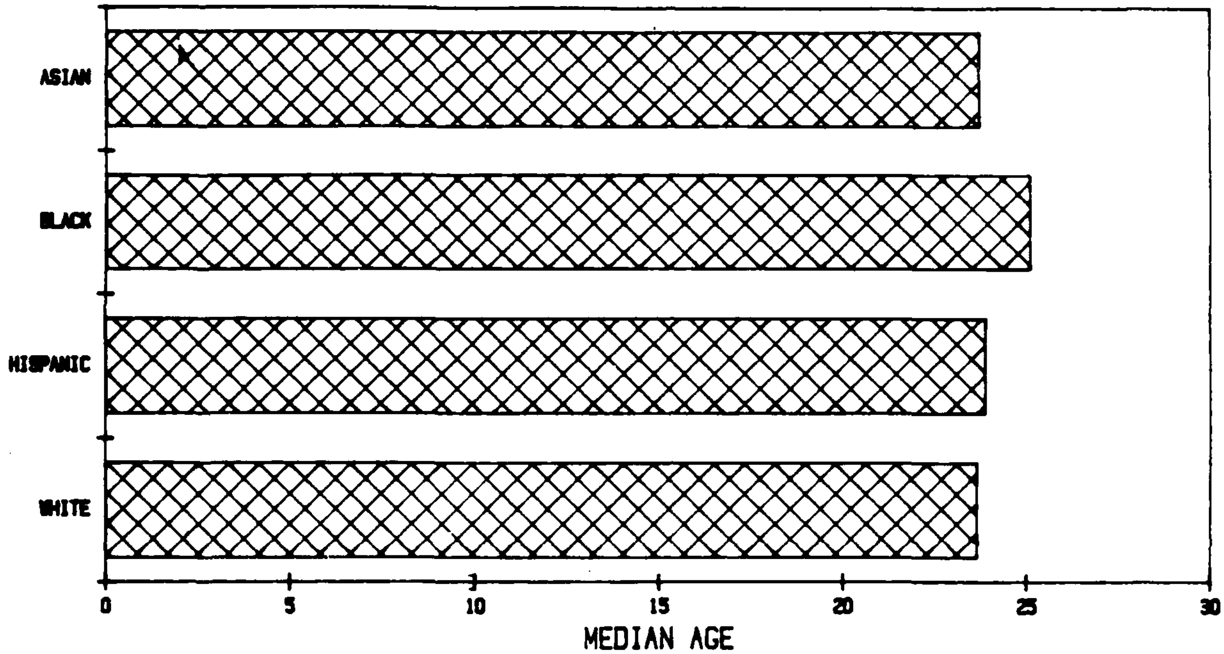
5.5 SELECTED RACE-ETHNIC COMPARISONS AMONG STUDENT NAVAL AVIATORS

The Navy is committed to equal opportunity (Navy Affirmative Action Plan, 1984), heavy growth is projected in the minority composition of the population pool eligible for naval aviation careers, and naval aviation training has an historically high minority attrition rate (Baisden and Doll, 1978; Petho, 1985). For these reasons, comparisons of the backgrounds and preparation of minority and nonminority Student Naval Aviator accessions are important to consider in monitoring demographic current and future productivity trends in recruitment and training.

Figures 5.51 to 5.64 present comparisons of minority and non-minority accessions on selected background characteristics of interest to naval aviation recruiters and trainers.

AGE (Figure 5.51): The overall age of Student Naval Aviation accessions is roughly twenty-three years and eight months; however, one important subgroup difference is evident. The average age of Black accessions is roughly twenty-five years, and the age of Black accessions varies more widely than the age of other minority and non-minority groups. This pattern is in part due to the greater propensity of Blacks to be accessed through the AOCS procurement market which, as noted earlier, tends on average to produce older accessions than APFI. However, Black APFI accessions also tend to be roughly one year older (24 years) than their nonBlack APFI counterparts (23 years). These racial differences in age among NASC accessons may have important implications for success in naval aviation training, to the extent that training performance is affected by age (see Petho, 1985).

FIGURE 5.51
AGE BY RACE-ETHNIC CATEGORY



EDUCATIONAL BACKGROUND (Figures 5.52-5.53): Despite some diversity in the educational backgrounds of race-ethnic subpopulations of Student Naval Aviators, the overall pattern among all groups reflects sound academic preparation. No significant subgroup differences exist between minorities and nonminorities for undergraduate college *grade point average*. Furthermore, any existing variance in college grades appears to be related to differences in *major field* concentration among the various race-ethnic subgroups -- race-ethnic minorities (especially Blacks and to a lesser extent Asians and Hispanics) are *more* likely to have earned their baccalaureate degrees in a technical field. It is not clear, from our data, whether these patterns reflect more selective recruitment of minority candidates by the Navy or whether there is more self-selection into naval aviation among minority individuals. However, if there is more self-selection, the Navy may face future problems due to greater competition from the civilian labor-market for highly talented minorities.

FIGURE 5.52
COLLEGE GRADES BY RACE-ETHNIC CATEGORY

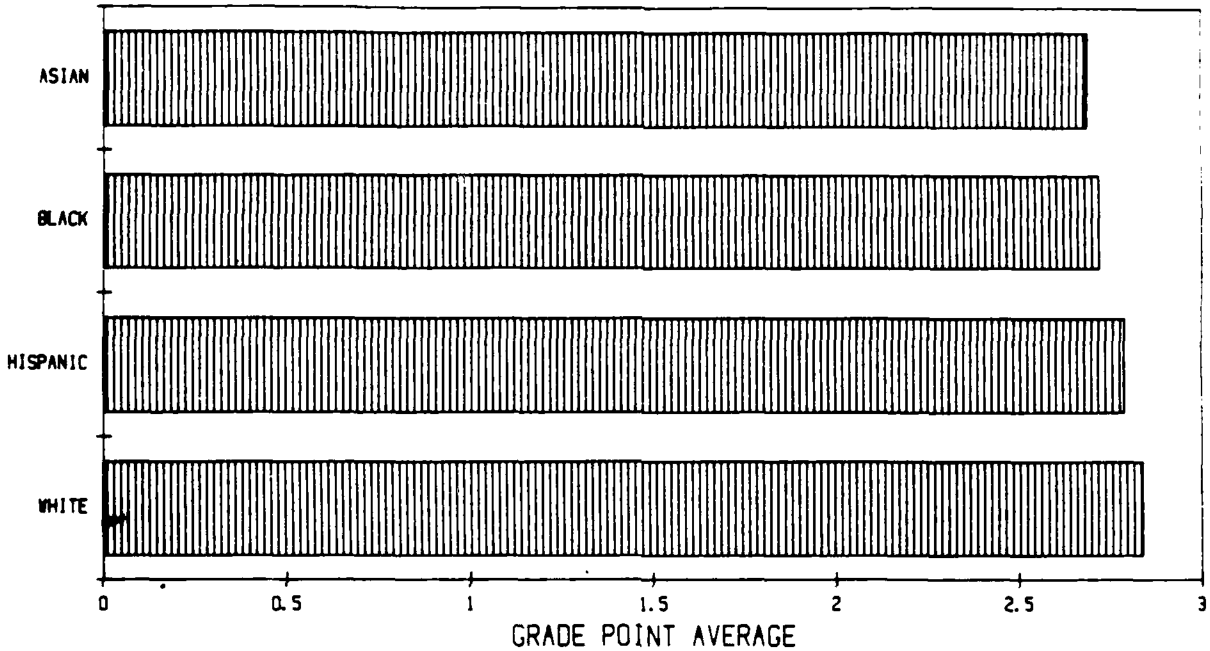
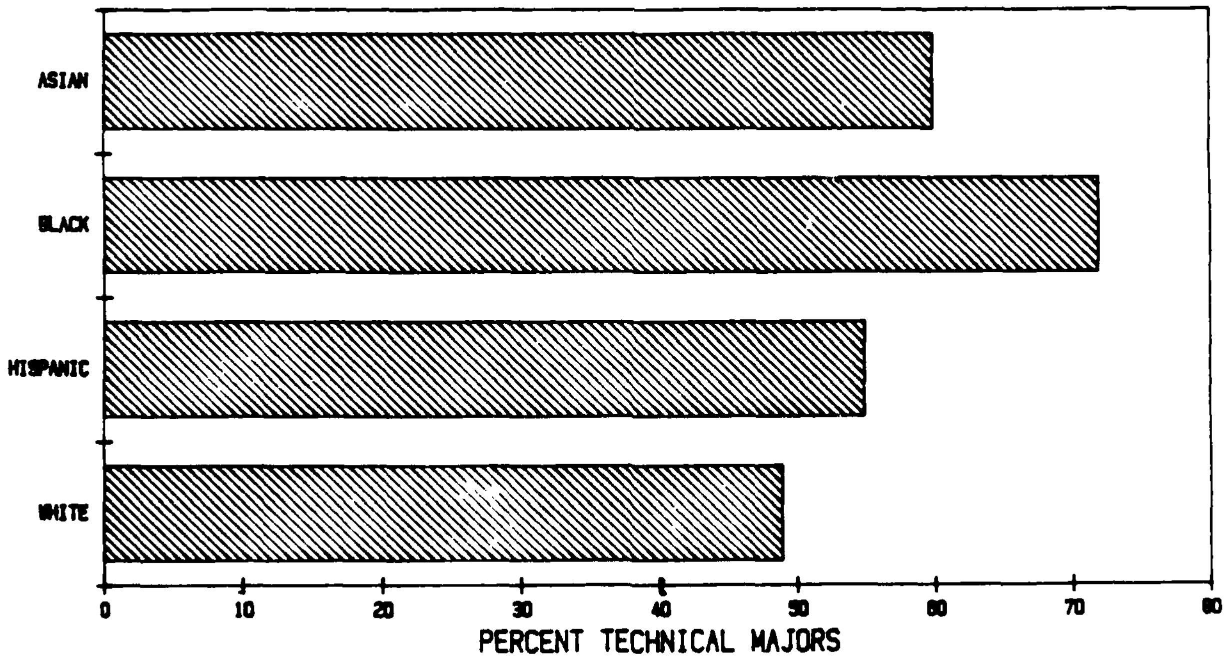


FIGURE 5.53
MAJOR FIELD BY RACE-ETHNIC CATEGORY



PREFLIGHT EXPERIENCE (Figures 5.54-5.56): As noted earlier, naval aviation training appears to be attracting significant numbers of candidates who have had the benefit of previous flight experience. Among the various race-ethnic subgroups, the proportion of accessions with previous flying experience ranges from one of four Asians, to about two of five whites, while Hispanics and Blacks fall in-between, with roughly one of three accessions having some pre-flight experience (Figure 5.54). These subgroup differences are not significant, however. The relative amount of previous flying experience also varies among race-ethnic subgroups (Figure 5.55): Considering median hours of previous flying experience, Blacks and Asians (50 and 40 hours, respectively) have somewhat more hours of pre-flight experience than whites or Hispanics (27 and 22.5 hours, respectively). On the other hand, Figure 5.56 shows that the proportion of accessions with pre-flight experience who have earned a private pilots license is quite similar across race-ethnic groups: 25% among Blacks, 29% among Asians, 25% among whites, and 29% among Hispanics.

FIGURE 5.54
PRE-FLIGHT EXPERIENCE BY RACE-ETHNIC CATEGORY

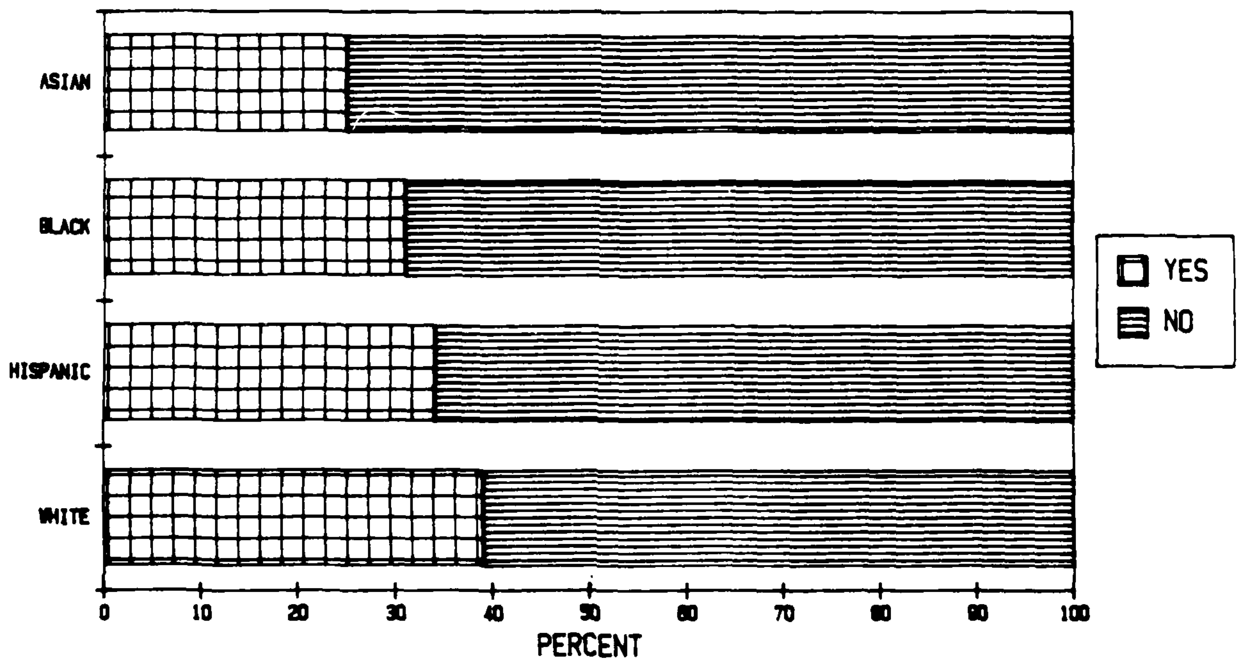


FIGURE 5.55
HOURS OF PRE-FLIGHT EXPERIENCE BY RACE-ETHNIC CATEGORY

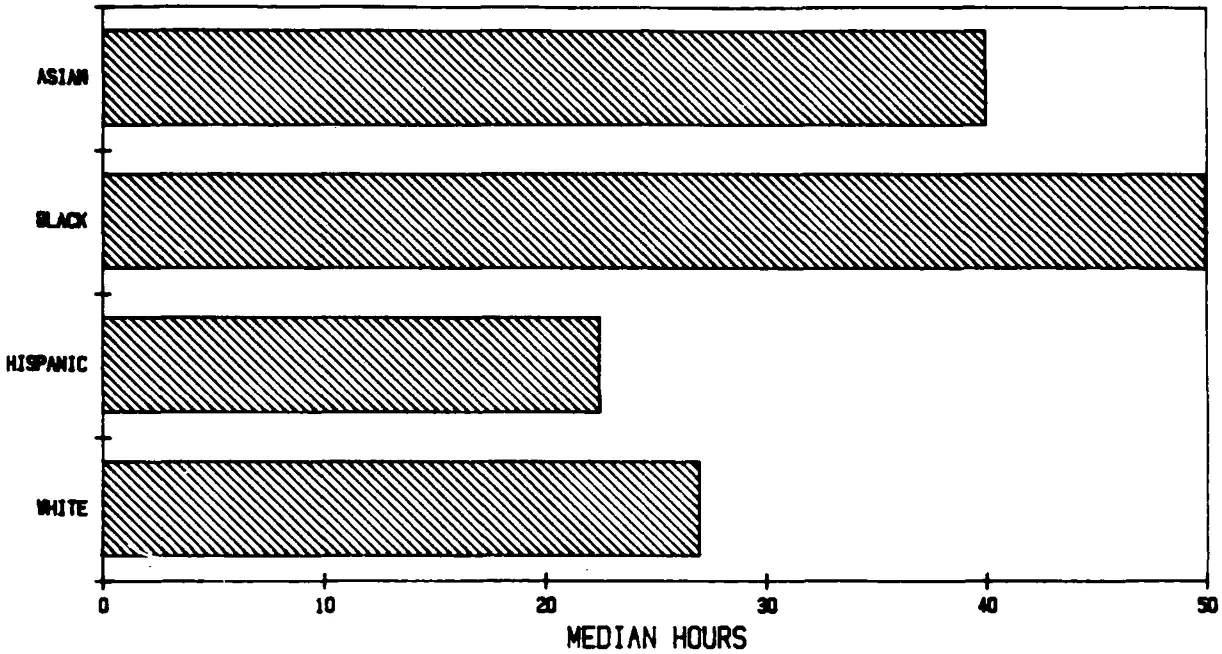
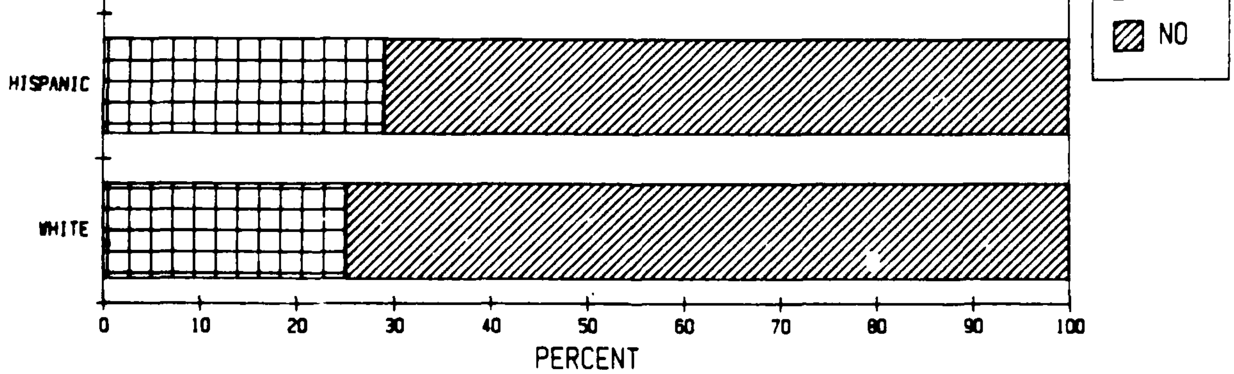


FIGURE 5.56
PRIVATE PILOTS LICENSE BY RACE-ETHNIC CATEGORY



SWIMMING ABILITY (Figure 5.57-5.58): A significant proportion (15-37%) of each race/ethnic subgroup of accessions in naval aviation training expects swimming to be "the most difficult" part of their training experience. Blacks, however, stand out in this regard -- they are roughly twice as likely as any other race-ethnic subgroup to anticipate major difficulties in meeting the swimming requirements of naval aviation training (Figure 5.57). This Black vs. nonBlack difference is consistent with other related results from the Student Information Survey. Figure 5.58 presents self-ratings which indicate that Black Student Naval Aviators (25%), much more than Hispanics (9%), whites (8%), and Asians (0%), are likely to judge their own swimming abilities as below average. These data provide some evidence of the continuing need for programs like Tadpole Swim, a recent NASC innovation addressing the complex problems faced by minorities in naval aviation training as a result of swim-related difficulties. Among each nonBlack race-ethnic group, however, approximately fifteen to twenty percent of accessions also expect that swimming will prove to be the most difficult aspect of naval aviation training, and the proportion who expect swimming to be most difficult is at least double the proportion who rate themselves below average in swimming ability.

FIGURE 5.57
ANTICIPATED SWIM TRAINING DIFFICULTIES BY RACE-ETHNIC CATEGORY

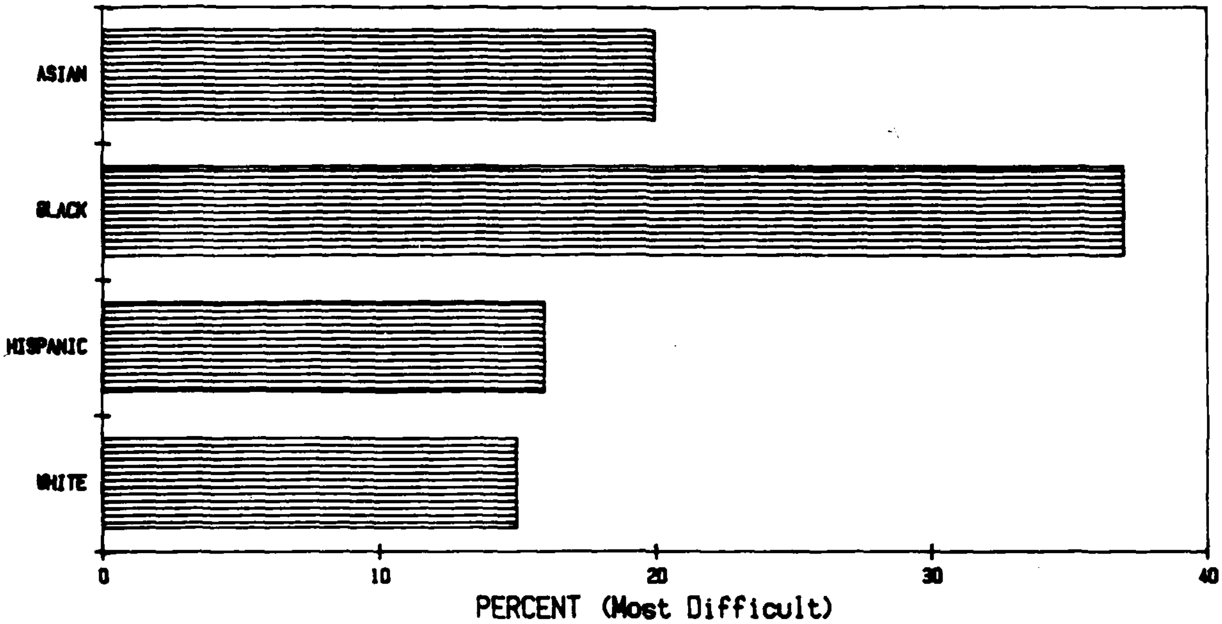
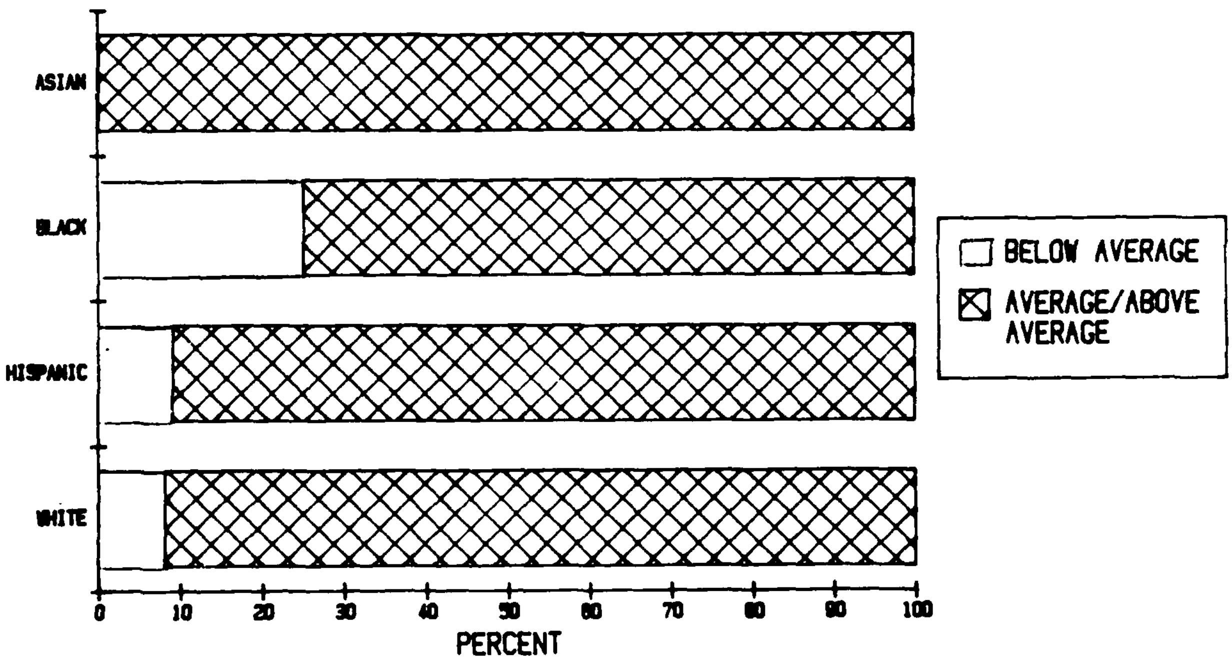


FIGURE 5.58
SELF-RATED SWIMMING ABILITY BY RACE-ETHNIC CATEGORY



EXTRACURRICULAR ACTIVITIES (Figures 5.59-5.62): Average rates of participation in selected extracurricularr activities among race-ethnic subgroups are presented in Appendix Table C5. Hispanics, Asians, and whites indicated an average participation rate of about three different activities while the rate for Blacks was two activities, based on a twelve-item activities checklist. Again, these rates indicate breadth of activities participated in by the different race-ethnic subgroups, but not intensity of involvement nor individual participation patterns. Data shown in Figures 5.59 to 5.62 reveal that the five activities participated in most frequently are, in rank order: among Hispanics -- intramural sports, professional organizations, intercollegiate individual sports, and (tie) Greek organizations/service organizations; among Asians -- intramural sports, professional organizations, intercollegiate team sports, and (tie) Greek organizations/service organizations; among Blacks -- intramural sports, professional organizations, and (tie) Greek organizations/intercollegiate team sports/intercollegiate individual sports; and among whites--intramural sports, professional organizations, intercollegiate team sports, service organizations, and Greek organizations.

Figure 5.59
PERCENT OF ASIANS INVOLVED IN SELECTED COLLEGE EXTRACURRICULAR ACTIVITIES

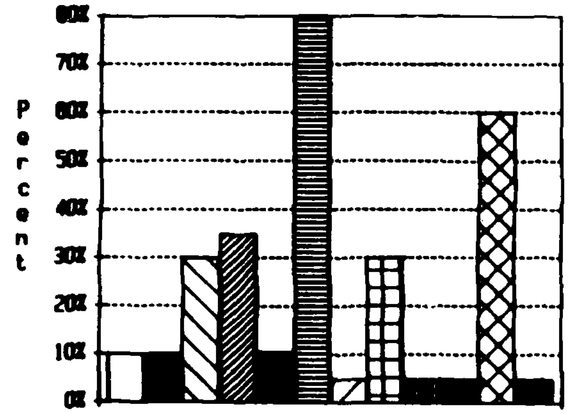
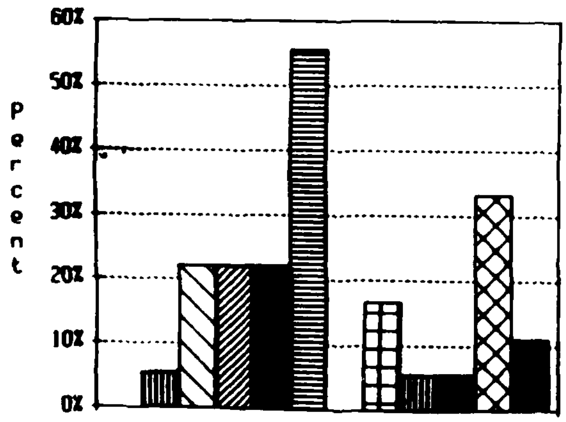


Figure 5.60
PERCENT OF BLACKS INVOLVED IN SELECTED COLLEGE EXTRACURRICULAR ACTIVITIES



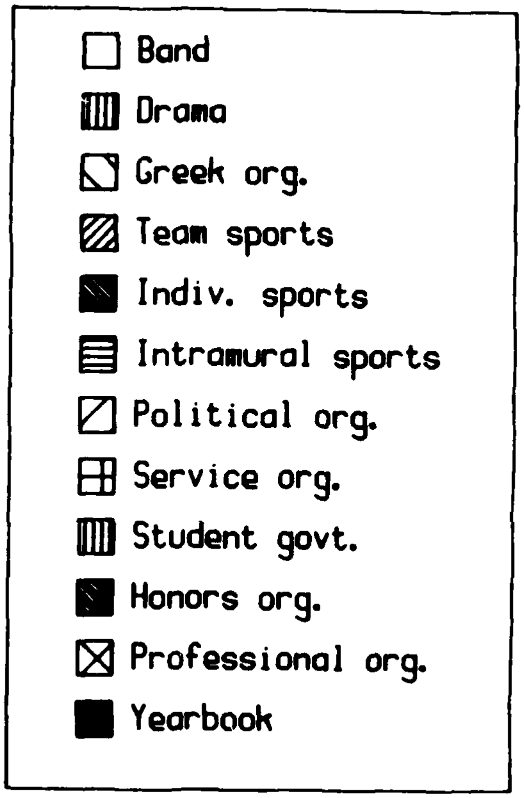


Figure 5.61
PERCENT OF HISPANICS INVOLVED IN SELECTED COLLEGE EXTRACURRICULAR ACTIVITIES

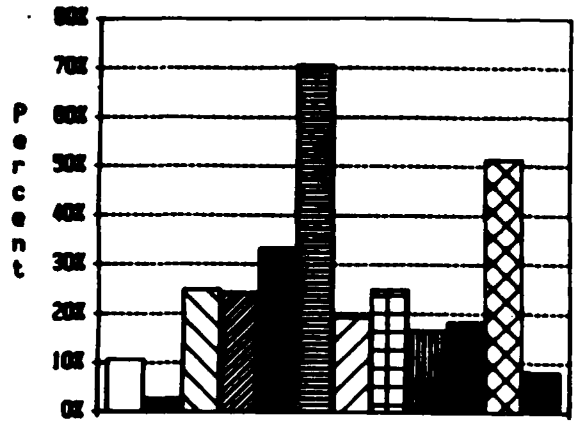
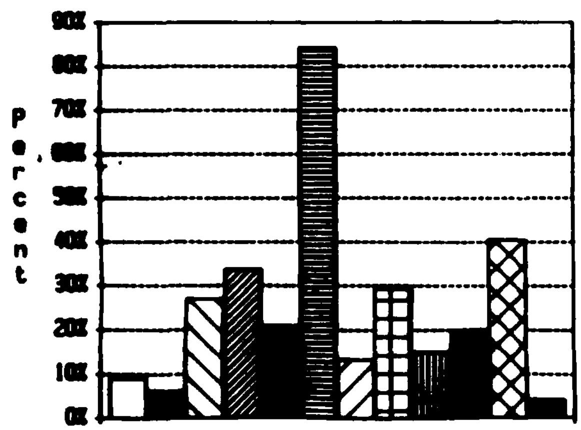
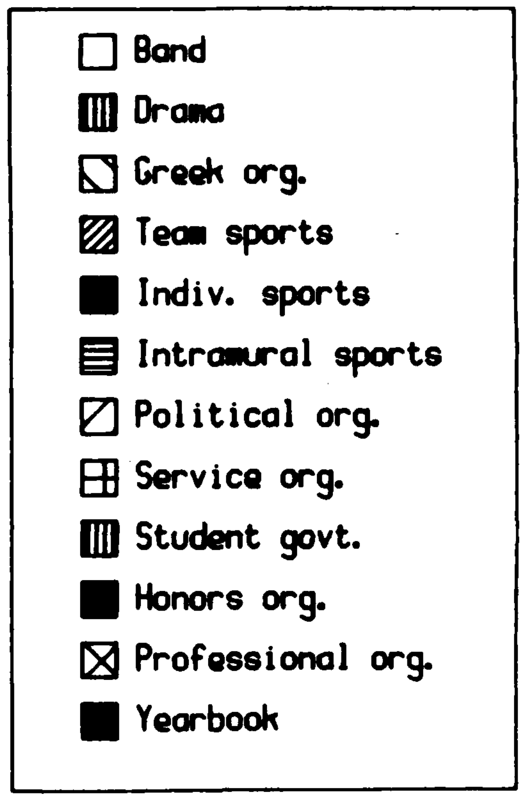


Figure 5.62
PERCENT OF WHITES INVOLVED IN SELECTED COLLEGE EXTRACURRICULAR ACTIVITIES





FITNESS/LEISURE ACTIVITIES: (Figures 5.63-5.66): Average rates of participation in selected fitness and leisure activities by race-ethnic subgroup are presented in Appendix Table C5. Based on responses to a twenty-two item activities checklist of fitness and leisure activities, the average number of activities of regular participation were similar for the different subgroups, ranging from 5.6 activities among Blacks to 6.3 activities among whites. Figures 5.63 to 5.66 show that in rank order, the five activities most frequently participated in are: among Hispanics -- running, swimming, tennis, biking, and basketball; among Asians -- running/tennis (tie), swimming, and basketball/weightlifting (tie); among Blacks--running, swimming, weightlifting, basketball, and table tennis; and among whites--running swimming, weightlifting, skiing, and tennis. Thus there is considerable similarity in both the rate and type of participation among the various race-ethnic subgroups. Again, the present data do not allow us to assess the extent or intensity of participation in these activities.

Figure 5.63
PERCENT OF ASIANS REGULARLY INVOLVED IN
SELECTED LEISURE ACTIVITIES

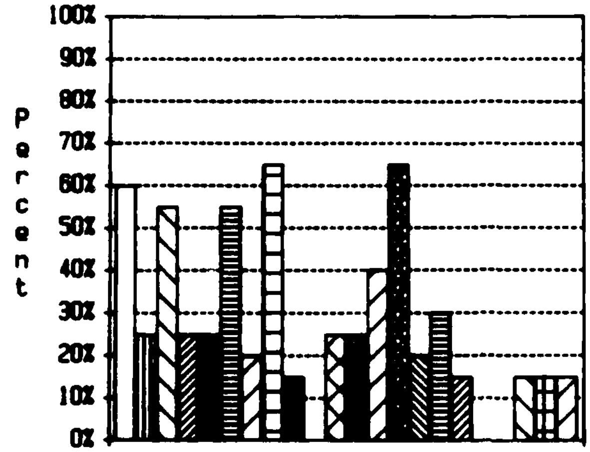
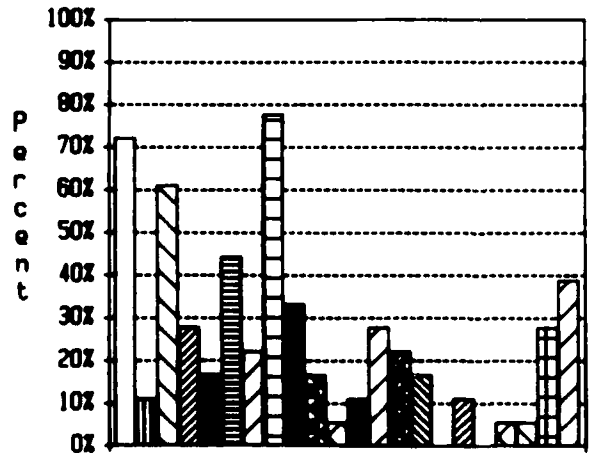


Figure 5.64
PERCENT OF BLACKS REGULARLY INVOLVED IN
SELECTED LEISURE ACTIVITIES



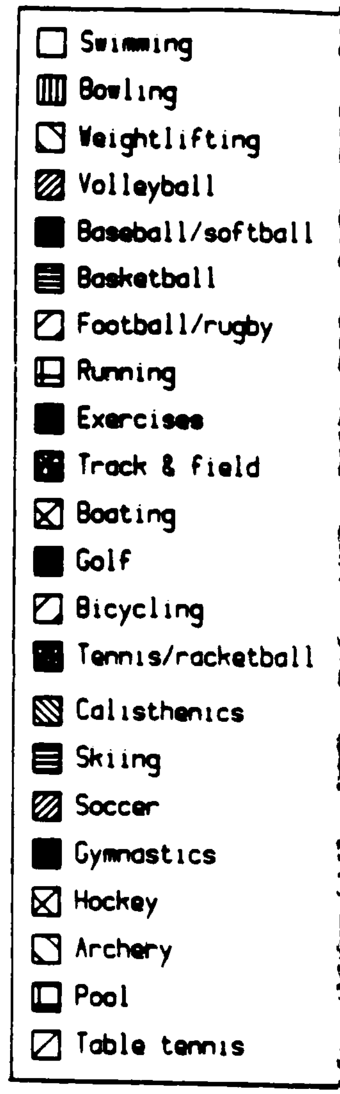


Figure 5.65
PERCENT OF HISPANICS REGULARLY INVOLVED IN SELECTED LEISURE ACTIVITIES

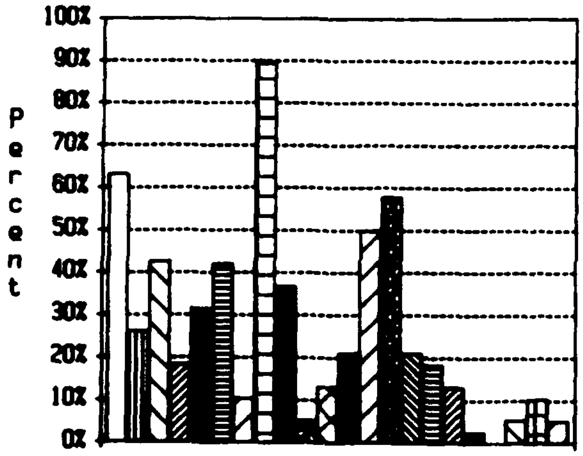
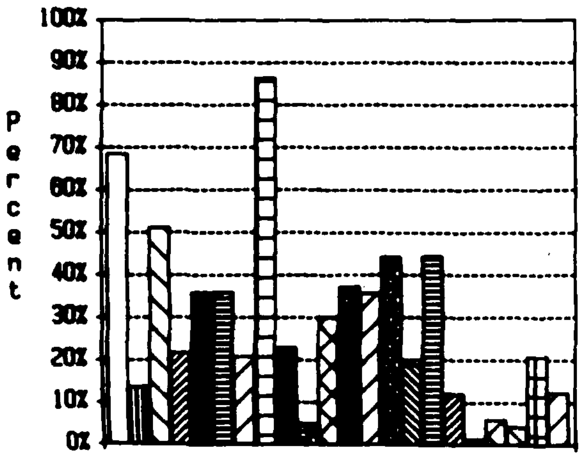
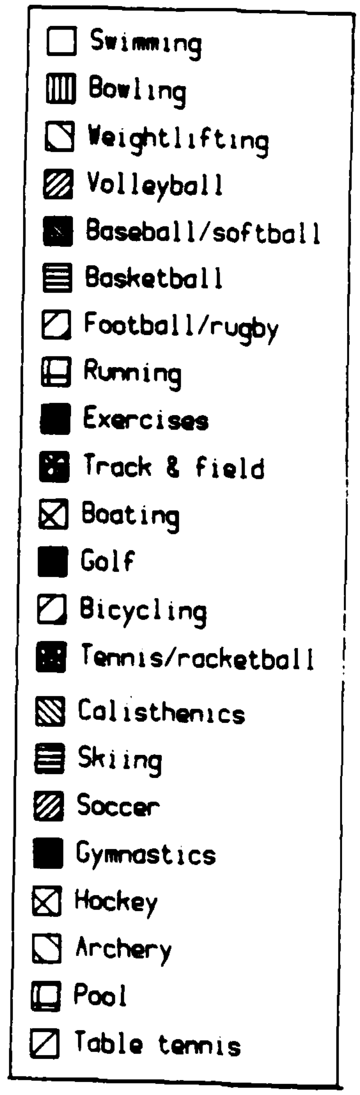


Figure 5.66
PERCENT OF WHITES REGULARLY INVOLVED IN SELECTED LEISURE ACTIVITIES





5.6 Summary

This chapter has presented a broad-based profile of recent accessions in naval aviation training based on surveys of Student Naval Aviators entering Schools Command during May 1986 through September 1986. The accession profiles for this period show that naval aviation training is attracting well-qualified and highly motivated individuals from the different procurement sources and among various population subgroups including racial-ethnic minorities.

CHAPTER SIX

Recommendations

6.1 INTRODUCTION

The recommendations culminating from our research activities have been informed by three main sources. First, there are the several files of student profile and training performance data supplied to us by CNATRA which formed the bases for our flowline and risk-factor analyses in Chapter Three and Chapter Four, respectively. Second, there is the descriptive profile data from the NASC Student Information Survey developed for this project. Finally, there are the rich and qualitative data from interviews conducted with naval aviation training and operational personnel at NAS Oceana, NAS Pensacola, NAS Whiting, NAS Corpus Christi and NAS Kingsville.

Our recommendations focus on a wide range of issues and vary in scope and complexity. They also vary in ease of implementation. We believe that the extensive and broad-based data upon which this project was based have yielded a rich set of recommendations for enhancing the productivity of naval aviator training. It is our sincere hope that at least some of the following recommendations should prove feasible and effective.

6.2 RECRUITING

6.2.1 Emphasis on Naval Officer Role

Issues:

Many candidates enter Aviation Officer Candidate School focused more intensely on a career in aviation than on a career in the Navy. They have exaggerated expectations about flying *per se*, and a lack of appreciation for the broader scope and magnitude of their future responsibilities as Naval Officers.

Recommendation #1:

Navy Recruiting Command should direct its recruiters in the field to emphasize the broad range of responsibilities of Naval officers when they portray naval aviation to prospective candidates.

Discussion:

Questionnaires completed during the first week of naval aviation training indicate that 35% of AOCS accessions expect to spend most of their time flying after they earn their wings. (This pattern holds true only for the Navy students; for Marine Corps students, the priority is typically on being an officer in the Marine Corps.) Apparently many of these candidates are not receiving a complete and accurate picture of their prospective Naval careers. This shortcoming in recruiting communications is likely to produce lowered morale, lowered performance, and decreased retention, as the realities of service become apparent to those who entered with misperceptions. Conversely, some potential accessions may find varied responsibilities attractive, and will be lost to Naval aviation if they fail to understand how well this career suits their interests.

6.2.2 Orientation to the Role of the Naval Flight Officer

Issues:

Delayed and incomplete information about the roles of Naval Flight Officers prevents some potential accessions from applying for naval aviation training. This lack of information also affects the morale and motivation of many aviation candidates assigned to the NFO program. And it contributes to the less-than-professional image that many student pilots hold of their NFO counterparts.

Recommendation #2:

Navy Recruiting Command should insure that its recruiters in the field communicate clearly with potential aviation candidates concerning the sophisticated and vitally important functions, roles, and responsibilities of Naval Flight Officers. Expanded use of films and videotapes could aid in this effort.

Discussion:

Naval aviation students assigned to the NFO pipeline often express a sense of second class citizenship, a feeling that predictably lowers motivation and morale and impedes the efficiency of the training program. This phenomenon is aggravated by the fact that flight officer training is a second choice for many naval aviation candidates. Questionnaires administered during the first week of aviation training indicate that at that point a number of AOCS accessions overestimate their chances of assignment to the pilot rather than the NFO program. (Some 80% of recent AOCS accessions reported expecting to enter the pilot program, whereas a much lower figure, approximately 65%, will actually do so.) This problem is especially acute for students diverted from the pilot pipeline because of vision deficiencies that disqualify them from pilot training. It is *after* arriving at Pensacola that many candidates take the NAMI physical, learn of their visual disqualification, and realize that their options are assignment as a student NFO or release from the Naval Aviation program. The reactions of these students will predictably be particularly problemmatic unless they have prior familarity with the many positive features of NFO roles.

Another contributing factor to low NFO motivation and morale is that many student pilots and fleet pilots continue to express significantly lower levels of professional respect for "back seaters," often claiming that they themselves would quit naval aviation before serving as an NFO. The status of NFOs has apparently improved considerably in recent years, but residual attitudes among pilots and pilot candidates may seriously undermine the spirit of teamwork that must exist if naval aviation is to be maximally efficient. Teamwork and respect among naval aviators would surely be enhanced if *all* accessions into naval aviation received more and better information on the sophistication and importance of NFO roles, from the time of their first communication with recruiters. Finally, potentially successful candidates for naval flight officer training may be lost if their contact with recruiters neglects to give them an appreciation for the full range of opportunities offered by the flight officer program.

6.2.3 Medical Examinations

Issues:

Only a small proportion of the AOCS accessions are receiving their qualifying physical exams at the satellite aviation medical facilities.

Too many naval aviation candidates are being found NPQ after their arrival at Pensacola, on the basis of physical deficiencies that could and should have been detected earlier.

Recommendation #3:

Instructions should be issued from the appropriate level of the [illegible] Department to insure that potential accessions receive their [illegible] physical examinations in certified naval aviation sate[illegible]

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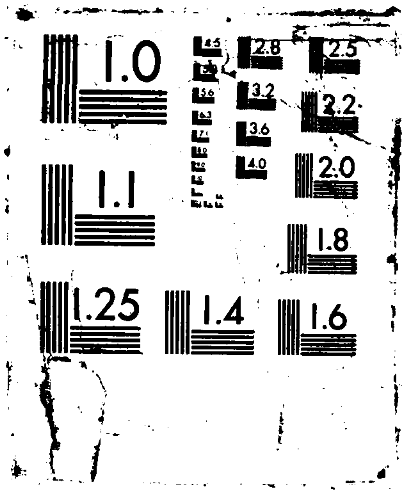
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2.2
2.5
2.8
3.2
3.6
4.0

Discussion:

Serious liabilities are incurred when potential aviation candidates are enrolled in Schools Command at Pensacola and *then* discovered to be not physically qualified. In the short run, unnecessary costs must be borne by the Navy, and often also by the would-be candidate, when such late NPQ judgments occur. The longer range liability is that the naval flight program loses credibility in the minds of the public. The decrement in public goodwill potentially can have a negative impact on future recruiting efforts.

6.2.4 Preparation for the Swim Requirement

Issues:

Nonminority naval aviation candidates with undeveloped swimming skills generally do not receive screening or referral into the TADPOLE swim program. Yet questionnaire responses indicate that one out of every seven recent AOCS accessions -- most of these nonminorities -- expect the aviation swimming requirements to be the most difficult aspect of their AOCS training.

Recommendation #4:

Navy Recruiting Command should insure that recruiters in the field 1) actively seek to assess the swimming skills of potential accessions to naval aviation, and 2) refer nonminorities and well as minorities needing swim pretraining to the TADPOLE swim program at Pensacola.

Discussion:

The TADPOLE swim program was instituted to provide necessary swim pretraining to minority entrants prior to commencing AOCS. A substantial segment of minority attrition from aviation training had earlier been found to be a direct or indirect effect of difficulty with the swim requirements. (Indirect effects occurred when candidates were forced to devote extra time to swim practice and sacrificed attention to their academic courses in Schools Command.)

TADPOLE swim has reduced attrition among minority candidates. However, many nonminority candidates could also benefit from TADPOLE training. A significant number of nonminorities in each class are at risk of unnecessary attrition as a direct or indirect effect of inadequate swimming skills. When questionned upon their arrival at Pensacola, 13% of recent entrants to AOCS expected the swim requirement to be the most difficult part of the training for them, and most of these were nonminorities. However, few nonminorities have participated in TADPOLE to date, primarily those who learned of the preswim program by accident.

The Schools Command staff confirms that the TADPOLE Program could accommodate nonminorities as well as minorities. The need, then, is to make sure that *all* weak swimmers and non-swimmers are identified and assigned to TADPOLE. As indicated in subsequent Recommendation #21, the most efficient means to achieve this and other goals would be to expand the NAVIP program to include all AOCS accessions. If expansion of NAVIF is not possible, however, it becomes essential that all recruiters be directed more aggressively encourage nonminority candidates to self-identify thei' swimming deficiencies.

A more inclusive TADPOLE swim program would have an important side benefit. Interview data clearly reveal suspicion and a measure of resentment toward minority-only programs on the part of aviation students and instructional staff. If TADPOLE is to promote rather than impede racial equity in naval aviation, it is crucial that this program be accessible to all candidates who need it, minority and nonminority alike.

6.2.5 Physical Fitness

Issues:

Many students arrive at Pensacola in a physical condition that is inadequate to meet the physical training requirements of the AOCS syllabus.

Recommendation #5:

In their communications with all AOCS selectees, field recruiters should be directed to emphasize the necessity of being in top physical condition and to urge selectees to undertake a systematically developed physical fitness regimen before reporting to Pensacola.

Discussion:

Current and former AOCS students and their instructors concur that many AOCS students arrive at Pensacola in such poor physical condition that much of their energy during AOCS is devoted to getting into shape. Some fail in this effort, but even those who successfully complete AOCS have commonly sacrificed other valuable learning while they worked to remedy their physical fitness deficiency. Recruiters could help alleviate this problem by

emphasizing to potential accessions the necessity of being in top physical condition when they arrive at AOCS.

6.2.6 Recruiting of Minority Candidates

Issues:

Minorities continue to be severely underrepresented among naval aviation accessions, not only in comparison to nonminorities, but also in comparison to relevant potential applicant pools (for example, the proportion of minorities among recent college graduates).

Recommendation #6:

The SEMINAR program should be expanded. All minority aviation graduates en route to the FRS should be invited and encouraged to spend a limited period of time at their hometown or college location, assisting in the recruitment effort. In addition, Navy Recruiting Command should explore other means of using minority aviation officers to assist in recruiting on an adjunct basis.

Recommendation #7:

Navy Recruiting Command should schedule fly-ins to traditionally Black colleges and to communities with large minority populations. Where possible, minority aviators should staff these hops and should be available for discussion with audiences.

Recommendation #8:

In high schools with large minority populations, NJROTC should be expanded and should include opportunities for swimming, flight orientation, and summer programs.

Recommendation #9:

Navy Recruiting Command should adjust the system of professional incentives so that recruiters can receive maximum competition points only if they meet their goals for minority accessions.

Discussion:

In recent years, Navy leadership has manifested increasing concern about the underrepresentation of minority officers in general and minorities in naval aviation in particular. Efforts to remedy this problem have met with some modest successes, but racial equity in naval aviation remains a distant goal. This research has examined possibilities for increasing racial equity in the training process, but a major factor is that few minorities enter training. Thus attention must also be directed to the recruitment process.

First, the use of minority aviators as recruiters presents a dilemma. Minority recruiters frequently can be very effective in reaching minority populations, but assigning large numbers of minority aviators to recruiting positions is not the most effective way to promote career advancement in this group, and could be self-defeating. Recommendations #6 and #7 circumvent this dilemma by focusing on possibilities for short-term or part-time participation of minority aviators in the recruitment effort.

Minorities are less likely than nonminorities to have been exposed to aviation at a young age through family or friends, and therefore they are less likely to develop aviation aspirations early in life. This impediment to naval aviation recruiting could be reduced by recruiting efforts that reach minorities during their pre-college years. This is the intent of Recommendation #8.

Finally, in the history of naval recruiting some major new recruiting thrusts have been highly successful -- recruitment for the Nuclear Power Program being a prime example. Industrial psychologists emphasize the importance of incentives in communicating organizational priorities to personnel, and the success of the nuclear power recruiting effort gives testimony to the impact of incentives in naval recruitment. Thus it is appropriate that the initiatives recommended above be supported by another: maximizing the professional incentives for recruitment of minorities. The present competition point system does reward recruiters for minority accessions. However, the present rewards for minority accessions are probably not in line with a cost-efficiency model, i.e. they are not necessarily large enough to encourage the extra time and effort that recruitment of minority aviation candidates may entail. The current decline in the number of Black college graduates implies that increased recruiting efforts will be necessary if naval aviation is to meet its goals for minority accessions. Thus there is particular importance in Recommendation #9, calling for adjustment in the system of professional incentives for recruiters so that full efforts to recruit minorities are encouraged.

The four recommendations presented above represent recurrent themes in the comments of minority and nonminority aviators interviewed during the

course of this research. The October, 1984, final report of the Minority Officer Accession Task Force addresses a broader spectrum of minority recruitment issues and recommendations that also merit continued attention.

6.2.7 Recruiting Command Accountability for Losses Prior to Commissioning

Issue:

The present system of accounting makes it difficult to assign responsibility for the substantial attrition that occurs at Schools Command.

Recommendation #10:

Recruiters should receive credit only for those accessions who successfully complete AOCS. Schools Command should provide feedback that permits CNRC to give each Recruiting District detailed information about the reasons for attrition among AOCS students recruited from that district.

Discussion:

The high attrition at AOCS has been of concern to Navy leadership. There is widespread belief among Schools Command personnel that much of the AOCS attrition takes place among students whose deficiencies were foreseeable, i.e. among students who never should have been accessed in the first place. Implemention of this recommendation would carry two potential benefits. First, it would encourage recruiters to become more selective as they direct candidates to naval aviation. Schools Command attrition would be directly reduced insofar as individuals having deficiencies that would predictably lead to attrition from AOCS will not be accessed. Secondly,

imposition of this kind of accountability upon the Recruiting Command will facilitate implementation of a similar incentive system in Schools Command: On the assumption that Recruiting Command is sending only well qualified students to AOCS, an incentive system can be implemented within Aviation Schools Command that rewards their staff for successful completions but does not reward them for attrites (see Recommendation #27). Thus this recommendation is an indispensable part of a two-pronged effort to reduce attrition from Schools Command and to enhance cooperation between Navy recruiters and Navy trainers.

The second part of Recommendation #10 is crucial: If this adjustment in the accountability system is to encourage recruiters to be more accurate in their judgments of which potential accessions can become successful naval aviators, each Recruiting District must be given feedback on the reasons for any School Commands attrition among candidates accessed by that district. If the accuracy of recruiters' judgments is to be increased, it is, of course, also crucial that the Navy continue to search for selection criteria that are more effective in predicting success in aviation training.

Also, this recommendation must be implemented in a manner that does not lead to an unwanted decrease in the diversity of AOCS accessions. Minority attrition has been high in naval aviation training, for reasons not yet thoroughly understood. There is evidence, however, that the problems manifested in minority attrition do *not* stem from insufficiently stringent selection criteria. Thus it is very important that recruiters do not respond to the history of high minority attrition by recommending fewer minorities for admission to the training program. If Recommendation #10 is implemented,

it must be implemented in conjunction with Recommendation #9, which adjusts the professional incentives for recruiters to insure that minorities are not overlooked in the recruitment process. Furthermore, Recommendation #10 should be implemented alongside encouragement for recruiters to avoid acting on unsupported preconceptions about the qualities necessary for nonminorities to be successful in naval aviation training. In summary, recruiters need to be made more responsible for the successful performance of naval aviation candidates. But it is equally important that recruitment practices facilitate the selection of individuals having the full range of personal styles and backgrounds that would enable them to be successful naval aviators.

6.3 NROTC

6.3.1 Introduction to Aviation

Issues:

NROTC graduates who enter naval flight training with no flying experience may be at a disadvantage relative to students who do have civilian flight experience, in terms of information, skill development, and confidence. (See the discussion accompanying Recommendations #15 and #20.)

Among NROTC graduates who attrite from the naval aviation training program because of aeronautical unadaptability or inadequate motivation, some would have self-selected out of aviation *before beginning* training, had they had the flight experience that would have allowed them to better assess their own suitability for

aviation. On the other hand, some potential naval aviators among NROTC students may be lost to naval aviation because they have not had enough experience to develop their interest in this career.

Recommendation #11:

All students participating in NROTC summer programs should receive broadened exposure to the aviation community. In addition, students should be invited to participate in introductory ground school training during the summer program and should be offered the opportunity for 10-15 hours of in-flight training.

Discussion:

This proposed innovation has three potential benefits. First, NROTC students who enter naval aviation training and who have the potential to be naval aviators may be equipped for more successful performance during flight training. Thus, training to satisfactory competence levels would be more efficient, and the potential for unnecessary attrition would be reduced. Second, students who are unsuitable for aviation could recognize this fact and select themselves out *before* beginning training; thus the costs of losses during training could be reduced. Third, offering ground school and flight experience to NROTC students would be an effective means to recruit a larger number of suitable candidates into naval aviation training. Members of underrepresented minority groups especially should be given this exposure to naval aviation. Although the special features of the NROTC program and Navy flight training requirements would necessitate a special program development effort, useful ideas might be gained from the flight instruction program and flight screening program offered to U.S. Air Force ROTC students.

6.3.2 Swim Training

Issues:

Although each NROTC student must qualify as a Class I swimmer in order to graduate, NROTC accessions frequently are inadequately prepared for the swim requirements of naval *aviation* training.

Recommendation #12:

NROTC students should be retested in swimming as they approach graduation, and the test to which they are subjected should more closely parallel the swim requirements of flight training.

Discussion:

A substantial proportion of students entering flight training (approximately 22% of those who enter directly into APFI) report that they anticiplate having more difficulty with the swim requirement than with any other aspect of the naval aviation training program. A number of NROTC accessions have indeed had great difficulty with the swim requirements during flight training, to the detriment of their progress in other areas of the curriculum. Two factors contribute to the problem: (1) NROTC students receive their swim test early in their college career and their swim skills deteriorate afterward, and (2) the NROTC swim requirements bear variable resemblance to the swim requirements for naval aviation candidates. Both these sources of inefficiency in the flight training pipeline could be alleviated by the straightforward and low cost measures advocated in Recommendation #12.

6.2.3 Orientation to the Role of the Naval Flight Officer

Issue:

As noted in connection with Recommendation #2, delayed and/or incomplete information about the roles of naval flight officers prevents some potentially successful NROTC students from applying for naval aviation training. This lack of information also affects the morale and motivation of many aviation candidates who are admitted to the NFO program. Thus it may increase attrition during training and lower subsequent retention rates. Additionally, inadequate information contributes to the "second class" image that many student pilots have of their SNFO colleagues.

Recommendation #13:

The NROTC curriculum should include an enhanced orientation to the various roles, functions, and responsibilities of Naval Flight Officers.

Discussion:

The Naval Flight Officer program is handicapped by the lack of public awareness of the many intricate and highly skilled functions performed by NFOs. A full discussion of this issue appeared in 6.2.2.

If NROTC accessions into naval aviation received more and better information on the sophistication and importance of NFO roles from the outset of their association with the Navy, improved teamwork among naval aviators would surely be a benefit. (Recommendation #2 proposes that Navy Recruiting Command direct a parallel informational program to potential AOCS accessions.)

6.4 DEVELOPING PROFILES OF SUCCESSFUL NAVAL AVIATION CANDIDATES

6.4.1 Evaluation of Recent Innovations

Issues:

The effectiveness of recently introduced modifications in naval aviation selection criteria is as yet unknown.

Recommendation #14:

CNATRA should undertake a long-term evaluation of accessions to naval aviation training with a 20/20 vision waiver (AVW) and those admitted via the NAVCAD, AVROC and Aviation Duty Officer programs. This evaluation should include a comparative analysis of training program completion rates, fleet performance, promotion, and professional development.

Discussion:

The four aviation training admission innovations instituted during the spring of 1986 at the direction of the Secretary of the Navy merit careful evaluation. It is generally true in evaluation research that the most readily accessible outcome measures are short term measures. The Naval Aviation Training program represents no exception to this general rule: The easiest evaluation research strategy would be to determine whether participants in the AVW, NAVCAD, AVROC, and ADO programs differ from other naval aviation students in terms of their performance during training. However, full evaluation cannot be limited to such short range outcome indicators. Downstream indicators such as rate of professional development, quality of fleet performance, promotion, and selection for aviation command should be

included to accurately assess the full impact and implications of these initiatives. Naval Personnel Research and Development Center has already begun to develop downstream performance indicators that could be useful for this research.

6.4.2 Predictive Utility of Flight Experience

Issues:

The impact of previous flight experience on performance in naval aviation has not been thoroughly evaluated. If the benefits of civilan flight experience are short-lived, this aspect of a potential accession's background should not receive heavy consideration in the selection process.

Recommendation #15:

Information about civilian flight experience gathered on the newly-instituted NASC Student Information Survey should be used to assess the short-term and long-term benefits of prior flight experience to naval aviators. Results should be used to guide Navy Recruiting Command on the importance of previous flight experience in the screening process.

Discussion:

The recently instituted Accession Questonnaire can be used to systematically examine the role of civilian flight experience in subsequent performance in the naval aviation environment. Civilian flight experience is currently considered in the screening of potential naval aviation students, but given different weight by different recruiters. Data collected in interviews with

naval aviators and naval aviation students suggests that civilian flight experience does promote confidence and enhances certain aspects of performance at the early stages of flight training, but the benefits of such prior experience are short-lived.

Some interesting research on the role of prior flight experience has been conducted by the CNATRA staff. The NASC Student Information Survey makes more extensive research possible. Examination of correlations between civilian flight experience and various aspects of performance in naval aviation training can address specific questions about the facilitative role of civilian aviation experience. If the impact of flight experience is transitory, Navy Recruiting Command can be so informed and can adjust its screening procedures accordingly. (Also, as acknowledged in Recommendation #20, if previous flying experience is shown to have an important long-term influence on performance in naval aviation, CNATRA should consider offering those with no experience an introduction to flight before their arrival at Pensacola.)

6.4.3 The Predictive Utility of the AQT and FAR.

Issues:

The predictive utility of the AQT and FAR is still being evaluated. Even the analyses performed as part of this research project provide only partial answers, because these studies can only examine the correlation of AQT and FAR with performance WITHIN the range of scores obtained by those accepted into naval aviation training.

Recommendation #17:

Recruiting Command and CNATRA should, for a limited time period, waive the AQT and FAR for potential accessions who have an undergraduate Grade Point Average above 2.8 (the mean for current aviation accessions), or who have a technical major and a Grade Point Average above 2.5. Students in this experimental group will be scheduled to arrive at Pensacola one day early, on which they would be administered the AQT and FAR, practice sections for the Graduate Record Examinations, and a series of other potentially predictive instruments. AQT and FAR scores for students who enter during this experimental period would be sequestered and would be available only to specifically designated personnel for research purposes. The predictive validity of the AQT and FAR would be assessed by comparing accessions earning low and high AQT and FAR scores in terms of their training completion rates, and ultimately *in terms* of the quality of subsequent fleet performance and Navy retention.

Discussion:

Thorough evaluation of any policy can take place only by comparing outcomes when the policy is in force with outcomes when the policy is not in force. The AQT and FAR were introduced as screening devices on the basis of early research findings that they predicted performance in aviation training. However, revalidation of these instruments as screening devices for modern day candidates has been hampered by the fact that the performance capacity of those screened out of naval aviation by low AQT and FAR scores is unknown: Because they were excluded from the program, their subsequent performance could not be assessed. This experiment, by suspending the use of AQT and FAR for a selected group of accessions, overcomes that handicap.

Several features of the proposed experiment should be emphasized. First, only those with GPAs at the mean for current AOCS accessions (2.8) or those with GPAs above 2.5 but with technical majors would have the AQT and FAR requirements waived. This protects against admitting students with obviously deficient academic backgrounds into the program. In the experimental cohort, applicants having lower GPAs would take the AQT and FAR at recruiting stations as usual, and these test scores would receive the customary consideration. The "sliding scale" provision is similar to the recommendation in the Mendoza and Abrahams (1984) validation study of the Officer Aptitude Rating as a predictor of Officer Candidate School performance, namely that OAR waivers be given most serious consideration for candidates having high GPAs.

Second, the waiver of the AQT and FAR requirements for these experimental students would be accompanied by a search for other, potentially more powerful predictors of success in aviation training -- more cost-effective alternate predictors that might be easier to obtain and less costly to administer than the AQT and FAR.

Finally, the scores obtained when the experimental group takes the AQT and FAR at Pensacola must be used only for the research and be tightly secured from general disclosure within the Training Command. Training staff reports that judgments of student performance are based in part on student records, including, where available, AQT/FAR scores. If the proposed research is to obtain an unbiased estimate of the relationship of AQT and FAR scores to student performance, it is essential that performance be judged independently of score results.

6.5 PREPARATION FOR AOCS/APFI

6.5.1 Swim Pretraining

Issues:

The existing TADPOLE swim pretraining program is not available to many candidates who need it: NROTC and USNA students are not eligible, and nonminority AOCS accessions rarely learn that TADPOLE exists and is available to them in time to participate.

TADPOLE has the reputation of being a minority-only program, and thus may foster suspicion and resentment among nonminority candidates.

Recommendation #18:

TADPOLE should be expanded to accommodate aviation accessions going directly into APFI and nonminority AOCS accessions who need to improve their swimming skills before facing the Schools Command swim requirements.

Discussion:

As noted earlier in this document, the TADPOLE swim pretraining program was developed in response to the observation that a substantial portion of the minority attrition from AOCS was directly or indirectly due to difficulties in passing the aviation training swim requirement. Some candidates never passed the swim test, while others passed swimming at the expense of lowered academic performance.

TADPOLE appears to have been very effective in reducing this unnecessary attrition among minority AOCS students. However, other naval aviation candidates could benefit from the program as well.

Accession questionnaire data confirm what interview responses had indicated: neither minority nor nonminority candidates entering directly into APFI are immune to swimming deficiencies. Among recent accessions into APFI, one quarter of the USNA graduates and 21% of the other candidates expected the swimming requirements to be the most difficult part of the Schools Command program for them. In NROTC, although midshipmen must qualify as Class I swimmers as a prerequisite for commissioning, this requirement is not necessarily similar enough to the Schools Command requirement nor checked close enough to college graduation to insure that NROTC accessions are prepared for the swim program in APFI. An earlier section of this report recommended that NROTC students be given more uniformly rigorous swim training and screening. If future years see implementation of that recommendation, there may no longer be NROTC accessions who need pre-APFI swim training. At this point, however, the interview data gathered during the course of this project confirms that the need exists.

Among AOCS accessions, many nonminorities have limited swimming skills when they enter Schools Command. Responses on the NASC Student Information Survey reveal that 13% of the students entering AOCS expect the swim requirement to be the most difficult part of aviation training for them, and most of these students are nonminorities. In theory these candidates could participate in TADPOLE swim now, but in fact very few of them are aware of its existence. It is important the the TADPOLE program have the resources to admit all students who need this preparatory training. Once this goal is achieved, the necessary task becomes one of referral. For AOCS accessions, the expansion of NAVIP proposed in subsequent

Recommendation #21 would be the optimal means to assure adequate referral mechanisms. Short of this, more aggressive action by recruiters, called for in Recommendation #4, addresses the need for referral of AOCS accessions. It is essential that those responsible for advising NROTC/USNA students also become active as referral agents so that all appropriate students participate in the TADPOLE swim program.

As noted when TADPOLE was discussed in the earlier Recruiting section of this report, the recommended expansion of TADPOLE would have an important side benefit: Minority-only programs are often viewed negatively by nonminorities, and in the long run TADPOLE could impede the Navy's efforts towards racial equity unless the program is demonstrably open to all who need it.

6.5.2 Pre-Reporting Guide

Issues:

Students entering AOCS are not uniformly familiar with the Navy nor with the structure of AOCS itself. Further, the technical backgrounds of these students vary, as do their levels of physical fitness. The lack of uniform preparation creates an inequitable situation among the candidates and increases the potential for unnecessary attrition.

Recommendation #19:

A Pre-Reporting Guide should be designed for distribution to all AOCS candidates as soon as they are notified of their acceptance for aviation training. The Guide should include:

a. A description of AOCS structure, mission, and goals; an outline of the courses and curriculum; and hints on how to best prepare for AOCS.

b. An outline of essentials of Navy structure, symbols, protocol, and so on (for example, insignia, ranks, rates).

c. A self-diagnostic test of technical concepts and methods. For those who have difficulty with this self-administered problem set, references for pre-AOCS individual study would be included.

d. Physical fitness guidelines, listing the AOCS physical training requirements and identifying appropriate exercise regimens for candidates to pursue independently as preparation for AOCS.

Discussion:

It is in the interest of the naval aviation program to encourage candidates to prepare for the various facets of AOCS as rigorously and appropriately as possible. The proposed Pre-Reporting Guide would encourage students who were less familiar with AOCS and the Navy and less extensively technically trained and physically fit to advance to the level of the better-prepared candidates prior to AOCS entry. Three things would thereby be accomplished. Equity would be increased, because accidents of family background and differences in college experience would have diminished impact. The potential for avoidable attrition from AOCS would be reduced. And the ambitious goals for AOCS training would become more attainable: Better-prepared entering students can be expected to reach a higher level of performance by the end of training.

6.5.3 *Early Flight Training Exposure*

Issue:

Recommendation #15 calls for evaluation of civilian flight experience on performance as a naval aviation student and as a naval aviator. If the benefits of early flight experience are substantial, the Navy should consider instituting a program to offer flight pre-training to those entering AOCS without flight experience.

Recommendation #20:

Conclusions generated from the evaluation of the effects of civilian flight experience should be supplemented with information about the effectiveness of the flight pretraining offered to aviation candidates in the U.S. Marine Corps and U.S. Air Force to inform the decision about whether to institute pretraining in flight for naval aviation students.

Discussion:

Flight pretraining, offered by other branches of the armed service to students who are entering aviation training without any flight experience, has received periodic consideration by the Navy. A major impediment to informed consideration of instituting flight pretraining before entry into naval aviation training has been limited systematic information about the impact of flight experience on performance in naval aviation. Some interesting research on the role of prior flight experience has already been conducted by the CNATRA staff. The new NASC Student Information Survey offers an opportunity for more extensive data collection on prior flight experience. When these data are correlated with subsequent performance, the questions of whether prior flight experience makes a difference and how much prior flight

experience it may take to provide real benefits can be addressed. Together with intelligence from the other branches that have offered flight pretraining programs, these research findings can enable the Navy to make a well-founded decision about the advisability of instituting flight pretraining for those without flight experience.

6.5.4 NAVIP

Issue:

The NAVIP program is currently limited to minority accessions. Only these candidates are offered the valuable orientation to the Pensacola environment, the initial assessment of swim skills and referral to TADPOLE swim pretraining where necessary, and the on-site NAMI physical examination.

Recommendation #21

NAVIP should be offered to all candidates, minorities and nonminorities alike.

Discussion:

The NAVIP program appears to successfully address several central needs of students scheduled for entrance to naval aviation training. The program familiarizes students with the naval aviation training environment, allows screening for swim skill development and referral to swim pretraining for those who need it, and guarantees that the physical examination received prior to entrance into Schools Command is the standard, thorough NAMI exam. However, these benefits are available only to minorities.

Nonminority candidates also would benefit from the NAVIP program. A substantial number of these students have inadequate swim skills and need referral to TADPOLE. And many nominorities have received a less-than-thorough physical exam off-site and then learned that they were NPQ after arrival at Pensacola to begin training.

The inclusion of nonminorities in NAVIP could significantly lower the attrition potential for all students and would have the additional benefit, noted earlier in this report, of avoiding the suspicion and resentment that minority-only programs can create.

6.5.5 Evaluation of AOCS Prep

Issue:

The AOCS Prep program has to date received only anecdotal evaluation.

Recommendation #22

A thorough evaluation should be conducted of the effectiveness of AOCS Prep in improving the aviation training performance of participants.

Discussion:

The success rate of students who have entered AOCS via the Officer Candidate Prep Program indicates this program has potential as a supplemental source of competitive aviation candidates. AOCS Prep merits further evaluation research, particularly research to ascertain what elements of the candidates' qualifying profiles appear to benefit most from the Prep Program.

Also, our information indicates that, to date, all participants in the AOCS Prep Program have been minorities, creating a perception that minorities are less qualified than nonminorities across the board. From a practical perspective, the applicability of this program to all potential aviation candidates, regardless of race/ethnic group, expands the pool of potential candidates for Navy Recruitment Command.

6.6 AVIATION OFFICER CANDIDATE SCHOOL/AVIATION PREFLIGHT INDOCTRINATION

6.6.1 Editorial Consulting on Textbooks

Issue:

AOCS/APFI textbooks lack standardization and quality control because they do not have the benefit of professional editing.

Recommendation #23:

Professional editors should review textbooks for AOCS/APFI courses as these texts are drafted and revised.

Discussion:

In most academic training settings, the primary authors of textbooks are specialists in the respective substantive areas. In this respect, having AOCS instructors create and revise textbooks for their academic courses parallels the practice in other educational settings. However, other

educational settings typically use course materials that *also* have been professionally edited by the publisher for clarity and organization. It is very important that AOCS/APFI students learn the content of their academic courses well. Because they are challenged with multiple demands during AOCS/APFI, it is also necessary that their learning be efficient. In the interest of improved thoroughness and efficiency of instruction, professional editing should be used to improve the quality of textbooks and other curricular materials.

6.6.2 AOCS Peer Ratings

Issues:

The present peer rating exercise may inadvertantly be an injustice to some students, increasing their risk of attrition. AOCS student raters have not been trained in the proper conduct of evaluations, nor have these students been sensitized to minority issues. Thus a high potential exists to base ratings on personality rather than professional competence, and also to manifest latent prejudice toward minorities.

AOCS students need to receive training in one of their most important future responsibilities -- the evaluation of subordinates.

Recommendation #24:

AOCS students should receive formal training on how to prepare enlisted performance evaluations and officer fitness reports. At the end of this training, the students should conduct peer ratings as a practice exercise in preparing evaluations. The peer ratings would be examined by Class

Officers, but they would not be quantified nor used as the basis for modifying a student's standing.

Discussion

Apparently one intended purpose of the present peer rating system is the screening of AOCS candidates. However, glaring cases of unsuitability are presumably detectable by the Class Officer and/or other staff members and do not depend on peer ratings for identification. With respect to more ambiguous cases, it seems inappropriate to have ratings that serve as screening recommendations made by other AOCS candidates who have had no training in evaluation methods and techniques, and who have not yet been sensitized to minority issues.

The peer rating system may also be intended to give the candidates experience in conducting evaluations. Indeed, competence in evaluation is an essential skill for professional naval officers. Therefore it is important that AOCS candidates should receive training as well as practice in conducting personnel evaluations. Including a segment on preparing performance evaluations and fitness reports in the AOCS curriculum would have a dual purpose: Responses on the NASC Student Information Survey indicate that 40% of AOCS entrants have an incomplete perception of the scope of their responsibilities as naval officers. A serious training component on conducting personnel evaluations early in the aviation training program would make one aspect of the leadership role of naval aviators more salient and give candidates a more accurate preview of this aspect of their future professional responsibilities.

6.6.3 Positive Motivation Programs in AOCS

Issue:

If AOCS candidates are to enter naval aviation with a positive view of the Navy, the exacting demands they meet during AOCS should be complemented by measures to increase positive motivation.

Recommendation #25:

THE AOCS program should include the introduction of more incremental privileges, together with such positive motivation builders as an ungraded orientation flight midway through the program, visits to fleet aircraft with the crew available for discussion, presentations from squadron/ship Commanding Officers and Command Chief Petty Officers, and so on.

Discussion:

It is a psychological principle that sustained effort can be encouraged by periodic positive reinforcement. This recommendation is an attempt to incorporate that principle into the AOCS experience. It probably is not important that any one particular positive motivational program be instituted. But it is important for students to recognize that the organization in which they will soon be leaders recognizes and encourages their effort with appropriate positive incentives.

6.6.4 Clustering Minorities in AOCS

Issue:

When only one, two, or three racial minorities are present in AOCS classes, they are vulnerable to such dynamics as increased visibility, performance pressures, and stereotyping.

Recommendation #26:

Minorities should be clustered in AOCS classes, if possible in groups of at least five or six.

Discussion:

In their presentation at the 1984 ONR-sponsored conference on minorities in technical fields, nationally-recognized social psychologists J. Martin and T. Pettigrew described social psychological dynamics typically observed when minorities are introduced one or two at a time to work settings (see Pettigrew & Martin, 1987). One such dynamic is exaggerated expectations for the minority member's performance--either low or high. Often low expectations are held by coworkers and supervisors, and these can have a pronounced, detrimental effect on minority performance. Even when the performance of "solo" minority workers does not decline, the low expectations of supervisors lead to unfairly poor evaluations.

But small numbers of minorities in work settings also face the other extreme, unrealistically high expectations, and the consequences can be equally detrimental to performance. Exaggerated positive expectations place the minority worker under extra stress, and evaluators can become disappointed and especially negative in response to performance that is merely satisfactory or average.

These are only some of the disadvantages faced by numerically small minorities in work settings, according to Rosabeth Kanter, a sociologist who has conducted extensive research on corporations. In such situations, minority workers face heightened visibility, social isolation, assignment to the role of representative for the entire minority group, and stereotyping.

Some of these dysfunctional social psychological dynamics can be alleviated by clustering minorities in slightly larger groups. Under such a clustering arrangement, the individual minority is in a work situation that more closely ressembles the work situation nonminority workers can take for granted.

Some clustering of minorities in AOCS classes has already taken place. The present recommendation is for this sociologically sound practice to be systematically implemented and expanded, creating larger clusters.

6.6.5 Incentives for Class Officers for Eliciting Superior Performance from AOCS Students

Issue:

The existing incentive system does not clearly reward AOCS staff for eliciting superior performance from aviation candidates.

Recommendation #27:

For each AOCS class, a CLASS SCORE should be computed and serve as one of the bases for evaluation of Class Officers. The scores should also be cumulated across classes, so that a semi-annual average of CLASS SCORES can become one of the performance measures for Schools Command as a whole. The CLASS SCORE is an easily maintained numerical computation

that provides a comparable quantification of class performance and encourages optimum performance and retention without incurring penalties for the loss of students who could not and should not have been retained.

Discussion:

AOCS currently emphasizes identifying deficient performance and responding to it, often by attriting the student involved. The reward system operating on the AOCS staff does not communicate an institutional message that staff members should be working to elicit the *best* performance from their students. The Class Officers are the Navy officers holding immediate responsibility for the progress of a class, but the institutional structure does not reinforce the idea that to be a successful Class Officer means having a class that excels in the AOCS curriculum. The proposed CLASS SCORE would provide such reinforcement.

The CLASS SCORE is a quotient, QUALITY POINTS divided by BASE. QUALITY POINTS, the numerator, is the sum for the class of the following quantities: (a) scores on all tests actually taken, with the Officer-Like Qualities ratings counting as a test; (b) for attrites, a score of 68 for each test taken by the class after the attrite was dismissed; (c) a score of 150 points for each candidate who graduates. The BASE is computed as the total number of scores entered into the QUALITY POINT computation for the class. It includes: (a) the total number of tests actually taken by all members of the class, counting the Officer-Like Quality rating as a test; (b) the number of tests attrites would have taken had they stayed in the class until graduation; (c) the number of 150-point graduation bonuses earned by the class.

Candidates who are assigned to G Company have tests taken before assignment to G Company included in the QUALITY POINTS and BASE of the class they were originally in, and the scores of tests taken after leaving G Company, together with the 150 point graduation bonus if they graduate, counted in the totals of the new class they join.

This system awards high CLASS SCORES to Class Officers (and ultimately to Schools Command itself) when students are earning high test scores and graduating. Because the test scores are primarily in academic courses over which the Class Officers have no control, high CLASS SCORES cannot be achieved by adjustment of grading standards but only by exemplary student performance. Class Officers, to promote higher grades, will have to work for improvement in the actual performance of students in their classes.

Previously-discussed Recommendation #10, concerned with recruiters' accountability for losses prior to commissioning, has the goal of insuring that students entering Schools Command have high potential for naval aviation. It is appropriate to accompany this measure with institution of a Class Score that rewards Schools Command staff for providing a training experience that activates this student potential. Subsequent Recommendation #29, revising the Time to Train indicator, is a parallel proposal pertaining to flight training.

6.6.6. AOCS Experimental Class

Issues:

AOCS has a demanding mission and set of goals requiring a multifacted program that encompasses:

a. Physical training so that graduates leave AOCS in top physical condition.

b. Indoctrination to military protocol, bearing, and discipline.

c. Academic education on topics essential to performance as a naval aviator and officer.

d. Training in the leadership skills needed to carry out the responsibilities of naval officers.

e. Familiarization with the history and traditions of Naval Aviation and the Navy.

f. Introduction of stress that tests candidates' commitment and forces expansion of their coping skills.

Information from past and present AOCS students and from instructional staff indicates that the existing AOCS program places particular emphasis on maintaining a high stress environment. One method used to introduce stress is to place requirements associated with various goals in competition with each other. (For example, important military training evaluations such as personnel inspections may be scheduled to coincide with major academic examinations.)

This strategy does successfully introduce high stress; however, it also limits the extensiveness and the effectiveness of achieving other goals. In this respect, the AOCS training process differs significantly from the U.S. Naval Academy and NROTC programs. The U.S. Naval Academy midshipmen undergo the intense stress of Plebe Summer and other stress intentionally introduced throughout the Plebe year, but care is taken to avoid placing stress endurance in opposition to academic

learning. In AOCS, where training time is more severely compressed than the U.S. Naval Academy and NROTC programs, the relative priority of stress endurance vis-a-vis other goals is frequently confused, and a "learn-and-dump" approach to academics is substituted for retentive learning.

AOCS is the primary source of naval aviation accessions. Insofar as the other goals of AOCS are less than optimally accomplished and success is based as much on frustration tolerance as on achievement and demonstrated potential, the AOCS training program is operating at less than peak efficiency.

Recommendation #28:

CNATRA should conduct an evaluation of the relative effectiveness of a modified AOCS training design. Nine consecutive classes would participate in an experiment, five receiving a modified AOCS program and four receiving the existing AOCS program. Candidates would be assigned to the respective classes at random, and the relative effectiveness of the programs would be assessed by comparing the two groups of students in terms of their training completion rates, quality of subsequent fleet performance, and Navy retention.

The experimental program would be characterized by several features. First, each of the goals would be addressed by a state-of-the-art training component. Second, leadership would receive relatively greater emphasis, parallel to its role in the U.S. Naval Academy program. Third, sequencing would be carefully planned so that optimal performance is encouraged in each aspect of the program and the various program segments are mutually reinforcing.

A detailed curriculum for the AOCS Experimental Class would be professionally designed in accordance with a set of specific guidelines and criteria. Navy Postgraduate School staff, the Navy's professional educators, would probably be best equipped to perform this task. After approval of the proposed curriculum by CNATRA, the program would be implemented by Aviation Schools Command, using carefully selected volunteer instructors selected from the instructional staff.

Discussion:

The scope and potential benefits of this recommendation make it a central element in this research report. In many ways the positive outcomes of the existing AOCS program are impressive, given the fact that the program operates under some acute structural limitations, such as deliberately induced competition among the segments of the program, traditional rather than state-of-the-art curriculum elements, and a relatively short training period.

This recommendation involves compiling a package of innovations that represent the latest developments in content and pedagogical technique, and testing that constellation of promising innovations in comparison to the traditional program.

Nine consecutive AOCS classes would participate, so that the sample sizes of the experimental and comparison groups would be large enough for findings to be statistically reliable. The intent is to guarantee at least four classes in each group. The ninth class would be an "extra" experimental class, to allow for possible difficulty in initial implementation of the experimental program that would eliminate the first experimental class from the final data analysis. If such difficulty occurred, the first experimental class would be defined as a trial run and the subsequent four implementations of the experimental program would be included in the research.

It is critical that students be assigned to experimental or traditional classes at random to guard against preexisting differences between the groups of candidates who participate in the two AOCS programs. Random assignment assures that subsequent differences between the two groups of candidates are in fact a product of the contrasting curricula. The term "control" group has been avoided in this discussion because it is unlikely that the classes not receiving the new experimental program would be totally unaffected by the experiment. In acknowledgment of probable "spillover" effects of the experimental AOCS syllabus, it is more appropriate to think of the traditional classes as a comparison group that through contiguity receive some diluted version of the experimental treatment. In the context of this research, short-term performance during primary or basic would be the simplest criterion on which to compare the experimental syllabus with the traditional syllabus. However, long-term criteria must be examined as well. The qualities most important for student aviators are not necessarily the same as those that are most important for officers. In particular, there is not much chance to demonstrate the skills acquired in leadership training until the new naval aviators are assigned to operational units and given leadership responsibility. Thus Fleet performance should be a key outcome measure.

Instructors for the experimental syllabus should be a select group. They must be quick learners, because initial implementation of a new program will be challenging. Further, they must be interested enough in the program to be enthusiastic about their instructional role. It is important that minorities be included among the experimental staff. Last, but importantly, a hallmark of the experimental program must be the accessibility of the instructional staff to the students.

With respect to the content of the experimental syllabus, a general framework can be outlined here. The *physical training* component must be extremely rigorous, and should be informed by the latest research in exercise physiology. Physical training techniques have been revolutionized in recent years: Physiologists have developed exercise strategies that are much more efficient than the "traditional" physical training regimen of calesthenics and running. One emphasis of modern physical training programs is incremental, quantifiable progress that is both safer and more effective than older methods. Also, the experimental class physical training program should lead into a maintenance program for lifelong fitness. The program should be structured so that candidates come to appreciate the intrinsic physical and psychological benefits of fitness and to commit themselves to a long-term physical fitness program.

With respect to *military training*, the thrust of the present program can serve as a model, but careful attention should be paid to sequencing, so that this program component does not conflict or interfere with others. Further, although the specialized role of the Drill Instructor has value for this component, the design should specifically incorporate more active supervision by the Class Officers who represent the Navy officer corps.

The *academic program* of AOCS should provide the academic base on which candidates can build for the rest of their careers. It is essential that the program emphasize *retention* and *synthesis* rather than the "cram-and-dump" strategy that both staff and student interviewees report to characterize the present AOCS program. Other elements of the program must be so scheduled that academic learning is facilitated. In the academic component, a balance of individual achievement and team cooperation should be rewarded. Cooperative learning strategies might well be used.

Leadership training should be as prominent in the experimental AOCS syllabus as it is in the U.S. Naval Academy curriculum, where leadership is represented by an academic department. Responses to the newly-instituted accession questionnaire indicate that 35% of AOCS entrants believe most of their time will be spent in the air after they earn their wings. During interviews, aviators with fleet experience commented about how inadequately prepared they were to deal with basic leadership responsibilities such as counseling, evaluating, and monitoring performance. It is essential that AOCS training provide a more accurate perception and more extensive training for the multiple responsibilities that AOCS students will eventually have as NAVY OFFICERS. Ideally, the leadership training component of the syllabus should entail exposure to enlisted personnel, because supervision of enlisted personnel will eventually be an important part of the officers' responsibilities. The military officer's commissioning document specifically addresses the fact that commissioned status and the rights, privileges, and responsibilities inherent therein are based on the "special trust and confidence" which very careful evaluation has found the commissionee to merit. It appears both explicit and implicit that one of the most basic, perhaps *the* most basic, responsibility of this trust and confidence is the ability to lead skillfully and effectively.

For the students in the experimental AOCS class to receive extended exposure to the operational Navy, the syllabus would include visits and presentations from aviation Squadron Commanders and surface and submarine Commanding Officers when possible; presentations from Command, Fleet, or Force Master Chiefs to address current needs and issues within the enlisted community and the need for effective leadership; and

visits by candidates to local training squadrons, where they could have the opportunity for discussions with student NFOs and pilots.

In the experimental syllabus, *stress* would be emphasized the first week of AOCS. After that, stress would be introduced primarily via rigorous demands of each of the other components, and would focus on spurring superior achievement rather than creating frustration over incompatible demands. In this respect, the function of stress would be more consistent to that in the U.S. Naval Academy plebe summer. In addition, marathon simulation exercises would be adopted to test and develop candidates' ability to function under stress.

Although the experimental syllabus would entail a major planning effort and certain start-up expenses, the established program should operate at much the same cost as the traditional program. When the ratio of costs to potential benefits is considered, the experimental syllabus might prove to be highly cost efficient.

6.8 TRAINING COMMAND

6.8.1 Time to Train

Issues:

The existing Time to Train index is an inadequate measure of training efficiency because it ignores the Navy's investment in aviation students who attrite from the program.

Recommendation #29:

Time to Train should be redefined to reflect the Navy's investment in all students who have begun training and to reward training units for instituting and implementing a pattern of student outcomes that maximizes the benefit-to-cost ratio for the Navy.

Discussion:

The current Time to Train index, computed as the average number of training days for squadron *graduates*, effectively rewards training units for graduating only those students who move most rapidly through the program. In terms of minimizing the current Time to Train indicator, training squadrons gain no advantage by graduating a higher proportion of their students, and in fact are rewarded for attriting those students who need additional training before becoming fully competent, despite the fact that attrition of students in whom a training investment has already been made is costly and inefficient for the Navy. In other words, the present index encourages training squadron instructors to ask "Can this candidate fly?" instead of "Can this candidate learn to fly?" The revised Time to Train index proposed here would take into account the training time invested by the training squadron in *all* candidates -- completers and attrites. Furthermore, it would take into account the Navy's investment in each candidate *prior* to entry to this stage of training.

TIME TO TRAIN would be computed as a quotient. The numerator would be the sum of three entries for each student (completer or attrite) in the class: 1) number of training days devoted by the training squadron to that student; 2) 20 points (to account for the investment represented by AOCS, APFI, and any earlier training), and 3) the number of training days it takes

the average student to complete any prior Training Command phases (for example, an advanced pilot training squadron would enter for each of its students the average number of days candidates in that pipeline spend in primary and intermediate training). The denominator of the revised TIME TO TRAIN index would simply be the number of candidates in a given class who successfully complete the program of that training squadron. The new index would be computed by each squadron for each class. Average training days in previous Training Command phases is used to represent the Navy's investment in the student upon entry to the squadron, so that a squadron is not penalized for training candidates who were slow to complete earlier phases of training. In effect, the index would reward squadrons for 1) temporal efficiency in that phase of training *and* 2) training to successful completion those candidates in whom the Navy has already invested substantial training resources.

6.8.2 *Data Mechanisms for Feedback on Flight Instruction*

Issues:

Flight instructors need and want more feedback on the subsequent performance of their students.

Evaluations of instructors are currently made without data on subsequent performance of students they have trained.

The data that would allow feedback on subsequent performance of former students trained by an instructor or a unit are part of the naval aviation training data bank, but they are not compiled in a way that allows feedback on instructional effectiveness.

Recommendation #30:

Data mechanisms should be put in place to provide trainers and training units with feedback on the subsequent performance of their former students.

Discussion:

Interviews at flight training squadrons revealed that many flight instructors feel some frustration because as teachers they must fly blind, rarely knowing what becomes of their students. This lack of feedback is a handicap in improving their instructional techniques. Instructor of the Month awards must currently be based not on any measure of *successful* training, but on a count of the hops flown and on the proximity of the instructor's grade average to a 3.0. Instructors themselves have pointed out that these criteria are superficial and quite possibly irrelevant to the quality of instruction. Finally, training squadron administrators need to learn which of their instructors are most effective, so that effective instructional techniques can be identified and encouraged.

6.8.3 *Facilitating Constructive Independent Study During Dead Time*

Issues:

Students and instructors fully concur that "dead time" during training can have detrimental effects on student performance and motivation.

Training squadron administrators report that some dead time is unavoidable, a product of bad weather, equipment problems, or other uncontrollable factors.

Recommendation #31:

Learning Centers at training sites should be equipped with curricular materials specifically constructed to allow pooled students to study ahead on ground school material.

Discussion:

The detrimental effects of dead time on performance and motivation were probably the most frequently mentioned concerns expressed by those interviewed about flight training. Students, instructors, and administrators agree that the minimization of dead time should be a top priority, but also agree that much dead time is unavoidable because of the weather, for example. The proposal to facilitate constructive student use of dead time is the next best alternative.

At present, Learning Centers are equipped with written and audio-visual materials so that students can catch up and/or get ahead on the courses they are taking. Recommendation #31 aims to expand the role of the Learning Centers for effective use by pooled students who choose to spend their waiting time pursuing independent study on ground school topics they will eventually be responsible for mastering.

6.8.4 *Open Hours at Simulator Stations*

Issues:

Present and former students believe that student performance would improve if simulator stations were open for more hours of voluntary student practice.

Recommendation #32:

The current contract for operation of the simulator stations at training sites should be amended so that simulator stations are open after scheduled hours for voluntary student practice.

Discussion:

In absolute terms, maintaining an expanded schedule for simulator stations may be costly. However, in the opinion of present and former students and flight instructors, such an expansion would be very *cost efficient* due to large prospective benefits for student flight performance. This is particularly true because the alternative, actual flight, is so much more expensive than simulator training.

As a side benefit, implementing this recommendation would reinforce student desire for independent work and self-improvement.

Because student use of extended simulator availability cannot be precisely ascertained in advance, simulator station hours should be expanded incrementally, until utilization records demonstrate that the need has been met.

6.8.5 *Naval Flight Officer Training*

Issues:

Many candidates become SNFOs only as an alternative choice, after having been found not physically qualified to be a student naval pilot by reason of vision deficiencies.

Within naval aviation, the full career pattern for the NFO appears to have come into its own only within the last decade.

Within the naval aviation training program, Student Naval Flight Officers acquire status and privilege at a relatively later point than student pilots.

FRS instructors report that many Naval Flight Officers arrive at the FRS with an undeveloped sense of airmanship.

Recommendation #33:

The mentoring system employed in VT86 should be used as a model for a mentoring system in VT10.

Recommendation #34:

Within NFO training, there should be greater emphasis on providing positive motivation and an enhanced sense of privilege and status, on a par with pilot training.

Recommendation #35:

The early flight experience of naval flight officers should be more extensive and more positive. Skill development and tests should be paced more evenly.

Discussion:

Multiple factors affecting the NFO program collectively create a pressing need for innovation if the potential of NFO training is to be fully realized. Because many SNFOs do not enter training with the enthusiasm that would be expected if this program were their first choice, measures that are likely to increase morale are especially important. For this reason, we suggest that the apparently effective mentoring system from VT86 be appropriately modified and implemented in VT10.

Similarly, giving SNFOs privileges as early as privileges are granted to SNPs is especially advisable because in the public view, and until a few years ago in the Navy, NFOs have not been fully recognized as professionals. If naval flight officers and pilots are to perform as a team in optimal fashion, both groups must recognize the value and complexity of the NFO roles. For this to happen, the NFO training program must be structured to more visibly affirm the necessity and value of the NFO.

Finally, there has reportedly been a tradition of introducing NFOs to flight in a manner designed to be unpleasant for them -- an unpleasant first flight typically followed by a flight in which the SNFO was given extensive responsibility. And the flight experience attained by the SNFO throughout training was apparently often insufficient to develop a full sense of airmanship. If naval aviators are to function effectively as a team, NFOs themselves and the pilots they will fly with must be confident of the NFO's airmanship. Increased attention must be given to earlier and more thorough development of airmanship in training.

6.8.6 *Increasing the Number of Unevaluated Instructional Flights*

Issue:

Students learn most efficiently when they have the opportunity to practice and ask questions outside an evaluational context.

Recommendation #36:

More unevaluated instructional periods should be interspersed with check hops during flight training.

Discussion:

During interviews at training sites, many present and former students reported that they could have improved their learning if they had had more flights in which the emphasis was clearly on instruction rather than evaluation. In the words of one former student, when evaluation is salient, communication takes priority over aviation and navigation. Students receive some familiarization flights that do not entail evaluation; this recommendation proposes that the proportion of such unevaluated instructional flights be increased.

An earlier recommendation called for the institution of data mechanisms that would allow flight instructors to receive feedback on their teaching in the form of progress reports on the subsequent flight performance of their students. Because the on-wing and other instructors responsible for unevaluated instructional flights have an important role in the educational process, it is particularly important that they receive such feedback.

6.8.7 *Selection of Training Command Flight Instructors*

Issues:

Assignments to flight instructor positions apparently are based as much on availability as on instructors' interest, temperament, or competence in teaching.

Training Command flight instructor positions are not sufficiently career enhancing to make them attractive to naval aviators who have other options.

Recommendation #37:

Commander, Naval Military Personnel Command, should insure that aviation detailers are provided specific criteria to use in the selection of officers to be assigned as Training Command instructors. These criteria should include 1) a personal interview and 2) a recommendation from the potential instructor's present C.O., evaluating the officer's suitability and qualification for this influential assignment.

Recommendation #38

CNP and CNMPC should enhance the attractiveness of flight instructor assignments. For example, Training Command instructor assignments could be accompanied by a guarantee for a subsequent fleet seat, and the instructorship assignment could be incorporated in the Precept to the Promotion Board from SECNAV.

Discussion:

During the interviews, flight instructors, present students, and former students alike noted that some flight instructors appear to be dedicated and highly effective, but others clearly would rather be performing some other function. The presence of flight instructors who are not particularly adept at teaching or do not want to perform that role penalizes students and can affect the morale of the entire flight training unit. If flight instructor assignments went only to officers who have appropriate motivation and teaching competence, the quality of instruction and the teamwork in training squadrons would certainly be enhanced.

Making flight instructor assignments more career enhancing would have multiple advantages. It would attract a larger number of top performers,

including minorities, from which to assign instructors. Morale would be raised among flight instructors as a group.

6.8.8 *Modifying the Cumulative Impact of Downs*

Issues:

Research evidence indicates that when negative performance records follow students and new instructors become aware of past failures, instructor biases can occur that interfere with teaching and lead to inaccurate assessment of student potential.

When students are aware that they are carrying a negative performance record around with them, the resulting low morale and discouragement may decrease student performance.

Recommendation #39:

Students should start each phase of training with a clean slate. Downs would accumulate only within phases of training, and boards would be determined by the number of downs within a phase.

Discussion:

A substantial literature documents the high potential for negative outcomes when teachers hold low expectations for the performance of their students. The negative impact of low teacher expectations can be pronounced, even when no factual basis exists for the teachers' negative judgment. In this sense, the negative expectations are truly biases.

When a naval aviation candidate is passed from one phase to another, the earlier training unit has certified the student's overall competence for that level of training and has judged the student ready to go on to the next level of training. The student should enter that next level of training free of any stigma from past errors and free from the feeling of starting out behind.

6.9 CONTINUING DATA ACQUISITION AND CONSOLIDATION

6.9.1 *Exit and Transition Questionnaires*

Issues:

There is a scarcity of systematic information about the effectiveness of detailed aspects of the aviation training program.

Recommendation #40:

An "Exit Questionnaire" should be designed and administered to all students leaving aviation training, both graduates and attrites. The questionnaire should assess the student's experience in naval aviation training. For attrites, voluntary or involuntary, the questionnaire should gather detailed information about reasons for attrition.

Recommendation #41:

A "Transition Questionnaire" should be designed and administered to all naval aviation students as they move from each phase of training to the next. The questionnaire should focus on the student's experience with the particulars of the training phase being completed. The Transition Questionnaire should ask students to comment on specific courses, familiarization flights, check hops, and so on.

Discussion:

Naval aviation students are invaluable sources of information about the training program as it actually reaches the students, and about the effectiveness of various program segments. CNATRA could benefit from a continuing flow of information about naval aviation training coming from those who know many aspects of the program best -- the students.

The Exit Questionnaire and Transition Questionnaire would have distinct purposes. The Exit Questionnaire would ask students to reflect back on their entire aviation training experience, to comment on the training program as a whole, and particularly to report their perception of the factors that accounted for their own successes and failures. The Transition Questionnaire would gather detailed information about the elements of each training phase, information useful in "fine tuning" of the program, revision of specific ground school courses, flight formats, and so on.

Data from each student's Exit and Transition Questionnaires should be recorded in a way that permits correlation with other elements of the student's data record.

6.9.2 *Establishment of Mechanisms for Long-Range Data Compilation*

Issues:

If the naval aviation training program is to operate at maximum productivity and efficiency, program content and structure must be devised and adjusted on a scientific basis, informed by as much data as possible. Continuing evaluation

research, essential to this goal, will be greatly facilitated by the current effort to enter information from students' Automated Training Jackets (ATJ) into a computerized data base. However, additional information needs to be added and collated with the ATJ information.

Recommendation #42:

CNATRA should establish ongoing data collection mechanisms so that a computerized data base is established containing the following information for each student: a) background data and aviation training performance records, as represented on the Automated Training Jackets; b) detailed background and attitudinal information being collected with the newly-instituted NASC Student Information Survey; c) information from the proposed Exit Questionnaire and the Transition Questionnaires.

Discussion:

In order to maintain and enhance the quality naval aviation training program that exists at this time, it is essential to conduct ongoing evaluation research. Knowledge of the ways in which naval aviation students with varying backgrounds and characteristics respond to each element of the program can equip CNATRA to "fine tune" the training segments to maximize student learning and performance.

The computerization of ATJ information will allow analysts to monitor rates of successful performance in the various phases of the program and to address questions about the relationship of student background to performance. The addition of data from the NASC Student Information Survey expands the possibilities for valuable research. Detailed information about previous flight experience, personal and family history, and reasons for

entering the naval aviation training program are gathered on the Student Information Survey, together with psychological and social psychological characteristics. Thus it becomes possible to ask what aspects of student performance (if any) are predicted by prior flight exposure, or by coming from a military family, or by preferring collaborative rather than individual work. Knowledge of such relationships with student performance could not only be used to inform the selection profile, but also to fine tune the training program to maximize the performance of students enrolled -- for example, by offering early flight exposure to those without such experience, by giving students unfamiliar with the military special orientation, or by advising students with varying psychological profiles to enter the program and pipeline that best suits them. Selected information from the proposed Exit and Transition Questionnaires would add an additional dimension, allowing analysts to examine the student perceptions and reactions that presumably mediate relationships between student characteristics at entry and performance outcomes.

Ad hoc data collection and analysis can provide beneficial program evaluation, but it is certainly more efficient for data collection and compilation to be institutionalized. The cost of installing such intelligence mechanisms is low. And in providing the possibility of research at any point on whatever questions are pertinent at that time, the potential benefits are very high.

6.9.3 *Experiment/Training Tool to Promote Race Equity in Performance Evaluations*

Issues:

Some aspects of performance evaluation during naval aviation training are discretionary and subjective, particularly check hops and review boards. Subjective and discretionary decisions are vulnerable to biases of various kinds, biases which may well be unconscious and unintentional.

Naval leadership is actively seeking to understand why so few minorities are successful in aviation training, and to rectify that situation. One possibility is that subtle and perhaps unintentional biases exist in the evaluations performed by the predominantly white instructional staff and review board members. Such biases can easily go undetected by outsiders and by the evaluators themselves, because the circumstances of each case are usually unique, and provide no standard to which the evaluator's judgment of a minority student can be compared.

There is need to assess the performance evaluations made by flight instructors and review board members for possible racial bias, and to insure that the training received by these officers teaches them to avoid bias.

Recommendation #42:

Two ongoing experients and training protocols should be instituted and integrated into the indoctrination of flight instructors and those who serve on student review boards, respectively. Each should be true experimental designs of the type that social psychologists have used effectively to examine subtle biases in other institutions.

Briefly, flight instructors and board members would be presented with detailed performance information about a hypothetical naval aviation student

and asked to record a judgment about the candidate. The performance information presented to these evaluators would be standard, but the hypothetical candidate would be presented differently to different evaluators -- sometimes as Black, sometimes white. Comparisons could then be made of the judgments of evaluators who were presented with identical performance information but with contrasting descriptions of the students purported to be responsible for that performance. These comparisons would serve both as experimental data and as the basis for discussion among the evaluators, sensitizing them to the dangers of unintentional bias. A detailed description of the experimental design is presented below.

Discussion:

The possibility of subtle and unintentional race bias among evaluators exists any time subjective and discretionary judgments are being made. The low completion rate of minority naval aviation students makes it essential to examine the influence of this factor. Such examination is virtually impossible in natural situations, however, because each case varies on a wide range of dimensions, and there is no standard against which the judgment passed on any particular student can be assessed for bias.

This recommendation calls for implementation of the standard scientific remedy for this dilemma, experimental intervention. As hypothetical cases are presented to evaluators, performance can be held constant while student characteristics alone vary. Differences in the judgments of evaluators considering hypothetical students with differing characteristics can then be interpreted to result from the student characteristic and not from aspects of the hypothetical student performance.

The experiment/training instrument concerned with flight evaluation would take the following form. A videotape would be made during a check hop in a trainer. Instruments and window view would be featured in the video; no view would be taken that would reveal the identity of the student. A voice overlay would be added to the video, taking the role of an observer present in the cockpit providing an ongoing report of facts that were not evident in the picture but that would be pertinent to a flight instructor performing an evaluation. This record of cockpit performance would be used to create four experimental stimulus tapes: On each, the standard record of the flight would be preceded by one of four video clips of the purported student as he arrived for the preflight briefing. The purported students would vary along two dimensions, race and presentational style. Two of the students would be white and two would be Black. One student in each racial group would manifest very proper military-like demeanor and bearing, as might be expected from the conventional son of professionals or Navy officers. The other purported student in each racial group would have a style of self-presentation that is less formal, proper, and conventional for a military setting. The unconventional white style might well be a relaxed, informal demeanor, in line with the stereotypical views of Southern Californians. The unconventional Black style would be some version of the demeanor associated with Afro-American subculture, and would include non-standard dialect.

The reason for varying student self-presentational styles as well as race is that biases may occur most acutely when the Black targets have a personal style that sets them apart from mainstream white culture. Varying the style of the white purported candidate offers the important side benefit of allowing

assessment of the extent to which personal style independent of performance influences evaluations of *white* naval aviation students. Evidence of this bias would indicate inefficiency in the evaluation process and would suggest one direction for enhancement of the naval aviation training program. (It should be noted that we suggest portraying all hypothetical students as males, to simplify the experimental design while representing the great majority of aviation students.)

The form of the experiment/training instrument designed to focus on student review boards would parallel that sketched above for evaluational flights. The standard report of performance information would be a summary of the student's record. The video camera could scan the written record of the student and the hearing room, while a voice reported the particularly pertinent facts. Again, this standard record would be reproduced and preceded by one of four supplementary video clips, each introducing the student subject of the hearing, a male who is either Black or white and has a conventional or unconventional style.

The format for use of these experiments is as follows. The group in training to be flight instructors or review board members would be divided in quarters and each shown one of the four videos. The evaluations provided by each of the four groups would be tabulated and entered into a data bank in which experimental information is compiled. Researchers would be assigned the task of data analysis, determination of signficance of any intergroup differences observed, and interpretation of results. Also, the group of trainees participating in that particular administration of the experiment would be given immediate feedback on the judgments made by the four

quarters of their group, and this information would be the basis of discussion about how to avoid evaluational bias.

Repeated administration of this experiment/training instrument would be necessary to actualize its potential either as a research instrument or as a training device, but word about the exercise would be likely to spread to potential participants, who would then be aware of the purpose of the exercise. This awareness can be countered in two ways. First, as this exercise is used in training, the potential problem of race bias in evaluations could be defined and discussed so that possible favoritism toward minorities is treated as seriously as prejudice against minorities. In other words, the message would be that bias in either direction has grave negative consequences, as indeed it does. Second, multiple versions of the student performance video would be produced in which the student performance portrayed would vary in competence. A particular group of evaluators would be shown the four versions of a single performance portrayal, but the next group would see the four versions of some different performance portrayal.

Thus, each evaluator group, even if aware of the exercise's purpose to detect subtle race bias, would be worrying about bias in either direction, pro-minority as well as anti-minority, and would have no prior knowledge of norms for evaluation of the particular performance they were shown. Even non-naive subjects could depend only on their subjective judgment to dictate the "appropriate" evaluation, which presumably would be the same evaluation they would offer if making a good faith effort to give a fair evaluation in actual training. This strategy may permit the detection of involuntary biases among evaluators, but does not address the possibility of

voluntary, malicious bias in the evaluation of minorities. Any such deliberate bias in actual evaluations would presumably be avoided by non-naive participants in the exercise proposed here. To the extent that deliberate race bias in evaluations exists, this research design would inadequately detect it, unless some means of preserving the naivete of prospective participants can be devised. The proposed design would, however, have the potential to detect unintentional bias, which is more likely to be an extensive problem.

CHAPTER SEVEN

Minorities in Naval Aviation Training: An Overview of Research Findings and Recommendations

The impetus for this research was the collective impact on naval aviation of three factors: changing demographics of the recruiting market, continuing significant losses of trained aviators to civilian airlines, and steadily escalating costs of training. Together, these factors have intensified the need for the Navy to recruit and train aviators with optimal effectiveness and efficiency. One crucial aspect of the changing demographic picture is the increasing proportion of minorities in the pool of potential candidates for naval aviation. Thus the recruitment and training of minorities is a practical issue, a key factor in optimizing the effectiveness of naval aviation.

This research project focused on issues of both recruitment and training, because we believe they are inseparable. Social science research on the performance of minorities in other occupational settings clearly indicates that problems currently faced by minority aviation candidates would be alleviated by the increases in the number of racial minorities in naval aviation training. With larger numbers of minority candidates, more nonminority supervisors and instructors will have the opportunity for personal interaction with minorities. There will be less tendency for nonminority candidates to place minority candidates in a perceptual spotlight. And minority candidates themselves will be less likely to feel that they are on trial on behalf of their groups as well as themselves.

All this speaks to more vigorous recruiting of minorities. But just as we know that successful training of minorities is partly a function of vigorous and successful recruiting, it is also the case that successful recruiting must in part be a function of successful training. There is certainly no more powerful an incentive for minorities who are prospective naval aviation candidates than to learn that minorities who have preceded them have been successful in

training. Conversely, there is no more powerful a discouragement to prospective minority candidates than to know that other minorities have been disproportionately unsuccessful in training. Thus, increasing the recruitment of minority candidates and increasing the percentage of minority candidates who successfully complete training necessarily go hand in hand.

The preceding chapters contain a number of important findings that are particularly relevant to minority recruitment and training. Chapter Five summarizes the data gathered from recent accessions and reveals the extent of underrepresentation of minorities in naval aviation training, in comparison to the pool of college graduates. In addition, this chapter quantifies the extent to which minorities are disproportionately likely to enter naval aviation training through AOCS rather than through NROTC or the U.S. Naval Academy. Also germane are the facts that minorities have lower AQT and FAR scores than nonminorities, and that Blacks are more likely than nonminorities to enter naval aviation training with a history of technical training. This latter observation raises the question of whether recruiters are being more selective in terms of technical background for Black prospective candidates than for nonminorities. Chapter Five also reveals that Black candidates for naval aviation are about equally likely to have had flying experience before entering naval aviation training as are nonminority candidates, although those Black candidates who have had flight experience enter with above-average levels of flight time. And there is documentation for the unsurprising fact that Black candidates are particularly likely to anticipate difficulties with the swim requirement.

Chapter Three identifies the group with the highest attrition as SNFOs who enter training via the AOCS program. Chapter Four reveals why this is relevant to minorities: Minorities are particularly likely to enter naval aviation training through AOCS, and they are particularly likely to be in the SNFO community. This is part of the reason for the high attrition of minority naval aviation training candidates: They are most likely to be found in the groups that have the highest risk of attrition (see also Petho, 1985). It would be a gross oversimplification, however, to see

this as the whole story. Minority candidates do indeed stand an extra risk of attrition by virtue of being overrepresented among AOCS accessions and among SNFOs, but even when compared to nonminority members of these groups, minorities show disproportionately high attrition. Chapter Four demonstrates that minorities do have lower AQT and FAR scores than nonminorities, but also that the low scores do not statistically account for the gap in performance scores between minorities and nonminorities: Minorities have lower performance scores in training than would be expected on the basis of AQT/FAR scores. Furthermore, the minority/nonminority gap in performance scores itself cannot account for the gap in attrition. There is a greater minority/nonminority gap in attrition rates than would be predicted on the basis of flight and ground school scores.

Chapter Four also calls attention to the subjective character of downs and boards, as underlined by their unreliability from phase to phase. Moreover, the unreliability that presumably reflects subjectivity in decisions about downs and boards is greater for minorities than for nonminorities.

The recommendations presented in Chapter Six reflect our joint interests in minority recruitment and training. The recommendations are based in part on site visits and interviews with scores of naval aviation personnel. But they also reflect the analyses reported in Chapters Three, Four and Five. The underrepresentation of minorities in naval aviation training is evident in the data summarized in Chapters Three and Five. Chapter Five reports the characteristics of very recent accessions to aviation training, and demonstrates that the underrepresentation of minorities is still acute. Thus one theme in the recommendations is that there be expansion in the various measures taken to increase the representation of minorities among those recruited to naval aviation training. The report includes recommendations that the use of Black aviators as intermittent recruiters through the SEMINAR program be expanded (Recommendation #6); that there be fly-ins at historically Black colleges and predominantly Black communities, using Black

naval aviators where possible (Recommendation #7); that JNROTC at Black high schools be expanded (Recommendation #8); and that there be increases in the rewards to recruiters for successful recruitment of minority naval aviation candidates (Recommendation #9). Chapter Six also contains the recommendation that systematic evaluation research be conducted to assess the effectiveness of AOCS Prep (Recommendation #22).

Referring to well-documented social psychological dynamics, it is recommended that minorities be clustered in AOCS, as a means of maximizing minority performance and positive intergroup dynamics (Recommendation #26). The data presented in Chapter Five, based on surveys with very recent entrants to naval aviation training, indicate that minorities are particularly likely to anticipate difficulty with the swim requirement. CNATRA has already recognized the importance of preparation for the swim requirement to successful completion of training by minority candidates, and this research underlines that importance. The report recommends expansion of preparation for swimming, including: enlargement of the TADPOLE preswim program to encompass APFI accessions, both minority and nonminority (Recommendation #18); retesting of minority and nonminority NROTC accessions as they complete their college education and prepare to enter naval aviation training (Recommendation #12). Also, Recommendation #4 of the report advocates encompassing in TADPOLE nonminority as well as minority AOCS accessions in need of additional swim preparation.

Modification of the peer rating procedure in AOCS is recommended (Recommendation #24), with the goal of making the peer rating exercise a more effective training experience, and also of avoiding any undesirable results that might derive from the present system, which leaves minority students vulnerable to intentional or inadvertent bias from evaluations by nonminority classmates who have had little or no training in race relations. The report also notes that peer relations between minority and nonminority candidates are likely to be facilitated if the programs that were devised to provide assistance to minorities were routinely open to all candidates, thus

avoiding any perception that minorities receive special treatment. Accordingly, Recommendations #4 and #18 call for the inclusion of nonminority AOCS and APFI accessions in the TADPOLE preswim program. Recommendation #21 calls for the inclusion of all candidates in the NAVIP introduction to Pensacola. And Recommendation #2 calls for expanding the availability of AOCS Prep to nonminorities.

The patterns of disproportionate and unexplained low performance ratings among minorities reported in Chapter Four, and particularly the patterns of downs, boards, and attrition for minorities beyond levels that can be accounted for by entry characteristics or aviation training performance scores, should be of serious concern to Navy training officials. The experiments suggested in Recommendation #43 to assess any race bias in decision-making by flight instructors and review board members is particularly important in light of the findings in Chapter Four.

The recommendations cited above make explicit reference to minorities in naval aviation training. Findings reported in Chapters Three through Five imply that some of the other recommendations in this report, thought not aimed explicitly at minorities or designed especially to address minority problems, would nonetheless have a disproportionately beneficial impact on minorities in naval aviation training.

For one thing, it was noted that a disproportionately large number of minorities enter naval aviation training through AOCS. It is to be hoped that in the long run, larger numbers of minorities enter aviation training from the U.S. Naval Academy and NROTC programs. For the present, however, the pattern of predominant AOCS accession for minority candidates means that the entire set of recommendations for AOCS included in this report are of particular concern for minorities. These include: Recommendation #5, that would have recruiters make special efforts to advise prospective AOCS accessions on how to improve their physical fitness before arrival at Pensacola; Recommendation #10, that would set up a system of accountability that

encourages appropriate selection strategies by recruiters; Recommendation #19, that calls for a pre-reporting guide for ROTC accessions; Recommendation #25, that calls for more positive motivation measures during AOCS; Recommendation #27, that would institute an accounting system that rewards particularly effective supervisors of AOCS classes; and Recommendation #28, proposing the institution and evaluation of a modified training design for a select number of AOCS classes.

As indicated earlier, minorities are disproportionately represented not only among AOCS accessions, but also among candidates for the NFO community. As noted in Chapter Four, we are not clear why this should be the case, and the predominance of minorities in the SNFO ranks is itself a cause for concern on the part of responsible naval aviation training personnel. We would certainly not want to suggest that the relative underrepresentation of minorities in pilot training should be accepted as inevitable. However, for the present, because minorities are in fact disproportionately found in the SNFO community, the recommendations concerned with SNFOs have the potential to show a particularly positive impact for minorities. These include Recommendation #1, that calls for efforts by recruiters to better educate and inform potential candidates about the importance of the NFO role; Recommendation #13, that would give the same charge to NROTC programs; and Recommendations #33, #34, and #35, that are aimed at enhancing the quality of training for SNFOs by expanding the mentoring system, emphasizing positive motivation and enhanced privilege and status, and offering more extensive and more positive early flight experience.

The recommendations in Chapter Six that are concerned with the issue of flight experience and flight pretraining are particularly important for minorities. These include: Recommendation #11, that calls for an opportunity for 10-15 hours of in-flight training as part of NROTC summer programs; Recommendation #20, that advocates the use of data from the newly-instituted accession questionnaire to assess the benefits of previous flight experience and inform

consideration of whether candidates should be offered pretraining in flight; and Recommendation #36, that calls for more unevaluated instructional flight training, presumably of greatest utility to those whose background leaves them with the greatest need for instruction.

Finally, the discussion of minority performance in aviation training presented in Chapter Four makes it very clear that several important questions about what happens to minorities in naval aviation training remain unanswered. Accordingly, Recommendations #40 and #41, calling for Exit and Transition Questionnaires to be administered to all naval aviation candidates, and Recommendation #42, calling for expanded compilation of data on candidates in training, are considered absolutely crucial for efforts to expand minority participation in naval aviation. The implementation of the research project reported here was delayed by the lack of a consolidated data base specifically designed for research. Without the kinds of data that Recommendations #40, #41, and #42 would produce, future efforts to address the on-going issues of enhanced training productivity and efficiency, including the issue of minority recruitment and attrition, will be similarly severely inhibited.

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APPENDIX A

Student Information Survey

(Form A)

Aviation Officer Candidate School

STUDENT INFORMATION SURVEY

As part of the Navy's ongoing efforts to enhance the productivity of the aviation training program, this survey will provide important background information on newly enrolled students.

Your responses to this questionnaire are for research purposes only and will in no way affect your training experiences. Responses provided to this questionnaire will not be used by Naval officials to make personnel decisions.

Individual responses are strictly confidential, only overall averages will be analyzed and reported.

Thank you for your cooperation.

Aviation Officer Candidate School

STUDENT INFORMATION SURVEY

1. **Name:** ____________________

2. **Social Security Number:** ____________________

3. **What is your sex? (Check your answer)**

   ☐ (1) Female ☐ (2) Male

4. **Write in your date of birth** (mo/date/yr): ___/___/___

5. **What is your race? (Check your answer)**

   ☐ (1) American Indian or Alaskan Native

   ☐ (2) Asian-American or Pacific Islander

   ☐ (3) Black

   ☐ (4) White

   ☐ (5) Other (write in) ____________________

6. **Are you of Hispanic origin or descent?**

   ☐ (1) Yes ☐ (2) No

   If yes, which group?

   ☐ (1) Mexican-American

   ☐ (2) Cuban-American

   ☐ (3) Puerto Rican

   ☐ (4) Dominican

   ☐ (5) Central American

   ☐ (6) South American

7. **What is your current marital status?**

   ☐ (1) Single ☐ (2) Widowed ☐ (3) Separated ☐ (4) Divorced ☐ (5) Married

8. **How many dependent children do you have who live with you?** (Write number) ______

9. **How many dependent children do you have who DO NOT live with you?** (Write number) ______

10. Who were you primarily raised by?

- ☐ (1) both mother and father
- ☐ (2) father alone
- ☐ (3) mother alone
- ☐ (4) aunt or uncle
- ☐ (5) foster parent(s)
- ☐ (6) grandmother or grandfather
- ☐ (7) older sister(s) or brother(s)
- ☐ (8) an orphanage

11. How many brothers and sisters do you have? (Write number) ______

12. How many of your brothers and sisters are OLDER than you are? (Write number) ______

13. What was the highest grade your parents completed in school?
(Check one answer in each column)

MOTHER

- ☐ (1) 8th grade or less
- ☐ (2) some high school
- ☐ (3) high school graduate
- ☐ (4) some college
- ☐ (5) BA or BS degree
- ☐ (6) graduate or prof. school

FATHER

- ☐ (1) 8th grade or less
- ☐ (2) some high school
- ☐ (3) high school graduate
- ☐ (4) some college
- ☐ (5) BA or BS degree
- ☐ (6) graduate or prof. school

14. In what type of community did you live when you were in high school?

- ☐ (1) rural area (fewer than 1,000)
- ☐ (2) small town (1,001 - 50,000)
- ☐ (3) small city (50,001 - 100,000)
- ☐ (4) medium-sized city (100,001 - 300,000)
- ☐ (5) suburb of medium-sized city
- ☐ (6) large city (over 300,000)
- ☐ (7) suburb of large city
- ☐ (8) in military communities
- ☐ (9) in two or more kinds of communities

15. In what region of the United States did you live when you were in high school?

☐ (1) North ☐ (2) West ☐ (3) Midwest

☐ (4) South ☐ (5) U. S. territory ☐ (6) foreign country

16. Write the date of your high school graduation (month/year): _______ / _______

17. What is the name and location of your undergraduate institution?

Name ____

Location ____

18. What is your highest level of education?

☐ (1) some college

☐ (2) Associates Degree (AA)

☐ (3) BA or BS degree

☐ (4) MA or MS degree

☐ (5) PhD, EdD, MD, JD or other professional degree

19. Did you complete your undergraduate degree?

☐ (1) Yes ☐ (2) No

Write the date of completion: (mo/yr): _______ / _______

20. How large was your undergraduate institution?

☐ (1) fewer than 1,000 students

☐ (2) 1,001 - 2,500 students

☐ (3) 2,501 - 5,000 students

☐ (4) 5,001 - 10,000 students

☐ (5) 10,001 - 20,000 students

☐ (6) 20,001 - 30,000 students

☐ (7) over 30,000 students

21. Which of the following best describes your MAJOR FIELD of study in college? (CHECK ONE)

- ☐ (1) Agriculture and Natural Resources
- ☐ (2) Archectecture & Environmental Design
- ☐ (3) Area Studies (*e.g.*, Asian Studies)
- ☐ (4) Biological Sciences
- ☐ (5) Business and Management
- ☐ (6) Communications
- ☐ (7) Computer and Information Sciences
- ☐ (8) Education
- ☐ (9) Engineering
- ☐ (10) Fine and Applied Arts
- ☐ (11) Foreign Languages
- ☐ (12) Health Professions
- ☐ (13) Home Economics
- ☐ (14) Law
- ☐ (15) Letters (*e.g.*, Philosophy)
- ☐ (16) Library Science
- ☐ (17) Mathematics & Statistics
- ☐ (18) Physical Sciences
- ☐ (19) Psychology
- ☐ (20) Public Administration
- ☐ (21) Social Sciences
- ☐ (22) Interdisciplinary Studies

22. *Counting ONLY undergraduate and graduate work, how many COURSES did you take in the following subjects?*

Courses taken in the following:	**(CIRCLE ONE answer on EACH LINE)**			
(a) ***Physical Sciences (e.g., chemistry,*** **physics, astronomy, geology)**	None	1-2	3-5	6 or more
(b) Mathematics and Statistics	None	1-2	3-5	6 or more
(c) Computer and Information Sciences	None	1-2	3-5	6 or more
(d) Engineering	None	1-2	3-5	6 or more
(e) Aviation and Aeronautics	None	1-2	3-5	6 or more
(f) Biological Sciences (*e.g.*, botany, ecology, zoology)	None	1-2	3-5	6 or more

23. What was your cumulative grade average in undergraduate school?
(Write in numerical gpa using four-point scale with one decimal place, where "A"=4.0, . . . "D"=1.0) ______

24. Approximately where did you rank in your undergraduate class? (Check one)

☐ (1) upper 5% ☐ (2) upper 10% ☐ (3) upper 25% ☐ (4) upper 50% ☐ (5) lower 50%

25. **While in undergraduate school approximately how many hours per week did you spend studying or doing homework?** ________ (hrs per wk)

26. **When you were in college how did you most often study? (Check one)**
- ☐ (1) I usually studied alone
- ☐ (2) I usually studied with a friend of the same sex
- ☐ (3) I usually studied with a friend of the opposite sex
- ☐ (4) I usually studied with a small group

27. **When you were in college which method of study was MOST EFFECTIVE?**
- ☐ (1) studying alone
- ☐ (2) studying with a friend of the same sex
- ☐ (3) studying with a friend of the opposite sex
- ☐ (4) studying with a small group

28. **When you were in college how good were you at taking notes in class?**
☐ (1) above average ☐ (2) about average ☐ (3) below average

29. **When you were in college how good were you at writing term/research papers?**
☐ (1) above average ☐ (2) about average ☐ (3) below average

30. **When you were in college how good were you at performing mathematical computations and procedures?**
☐ (1) above average ☐ (2) about average ☐ (3) below average

31. **When you were in college how easy was it for you to memorize facts?**
☐ (1) above average ☐ (2) about average ☐ (3) below average

32. **How well do you perform on timed tasks?**
☐ (1) above average ☐ (2) about average ☐ (3) below average

33. **As an undergraduate, did you participate in any of the following types of activities?**

(Circle one number for each line)

	DID NOT PARTICIPATE	PARTICIPATED ACTIVELY	PARTICIPATED AS A LEADER OR OFFICER
(1) Band, choir etc	1	2	3
(2) Drama, debating etc	1	2	3
(3) Greek organizations	1	2	3
(4) Collegiate team sports (*e.g.*, baseball)	1	2	3
(5) Collegiate individual sports (*e.g.*, golf)	1	2	3
(6) Intramural sports	1	2	3
(7) Political organizations	1	2	3
(8) Service organizations	1	2	3
(9) Student government	1	2	3
(10) Honorary organizations	1	2	3
(11) Major field and pre-professional orgs	1	2	3
(12) School yearbook etc	1	2	3

34. **When you were in elementary school, high school and college, about how many of the students in your school were MINORITY (e.g., Black, Hispanic, or Asian)?**

(Circle one number for each line)

	NONE	FEW	ABOUT A QUARTER	ABOUT HALF	MOST	ALL
(1) in elementary school	1	2	3	3	4	6
(2) in high school	1	2	3	3	4	6
(3) in college	1	2	3	3	4	6

35. In the past three years, approximately how many hours have you spent in formal classes, training, or workshops on computer-related topics? (For example, a two-day, all-day workshop is about 12 hours; a 3-unit college course might be about 45 hours of classes.)

- ☐ (1) less than 10 hours
- ☐ (2) 10 to 19 hours
- ☐ (3) 20 to 49 hours
- ☐ (4) 50 to 100 hours
- ☐ (5) more than 100 hours

36. Other than in a training or workshop situation, have you ever done any of these things with a computer? (Circle one number for each line)

	YES	NO
(A) Given the DIRECTORY or CATALOG command, i.e., commanded the computer to display on the screen the names of programs stored on a disk	1	2
(B) Modified a computer program written by someone else to make it operate a little differently	1	2
(C) Used a program for making graphic pictures on a computer screen or printer	1	2
(D) Played an arcade-style game on a computer	1	2
(E) Developed a computerized file and stored and recalled data from it	1	2
(F) Written a computer program at least 50 lines long	1	2

37. How many of the following technical computer terms and acronyms can you explain? (Circle as many as apply)

CAI	Modem	Debugging	Baud Rate	Pascal	Parameter passing
CMI	DOS	Floating point	Hard copy	Global change	NONE OF THESE

38. Since completing your full-time schooling have you worked at a job of any type? (Check one)

- ☐ (1) yes, full-time
- ☐ (2) yes, part-time
- ☐ (3) no, I have not worked (Skip to Question 40)

39. Which of the following categories comes closest to describing your most recent job?

(1) CLERICAL (*e.g.*, bank teller, bookkeeper, secretary, mail carrier, ticket agent)

(2) CRAFTS (*e.g.*, baker, automobile mechanic, painter, plumber, telephone installer, carpenter)

(3) FARMER, FARM MANAGER

(4) HOMEMAKER or HOUSEWIFE ONLY

(5) LABORER (*e.g., construction worker, car washer, sanitary worker, farm laborer*)

(6) MANAGER, ADMINISTRATOR (*e.g.*, sales manager, office manager, school administrator, buyer, restaurant manager, government official)

(7) MILITARY

(8) OPERATIVE (*e.g.*, meat cutter, assembler, machine operator, welder, taxicab, bus, or truck driver)

(9) PROFESSIONAL (*e.g.*, accountant, artist, registered nurse, teacher, athlete, engineer, librarian, social worker, politician)

(10) PROPRIETOR or OWNER (*e.g.*, small business, contractor)

(11) PROTECTIVE SERVICE (*e.g.*, detective, police officer or guard, sheriff, fire fighter)

(12) SALES (*e.g.*, salesperson, advertising or insurance agent, real estate broker)

(13) SERVICE (*e.g.*, barber, beautician, practical nurse, private household worker, janitor, waiter)

(14) *TECHNICAL (e.g., drafting, medical or dental technician, computer programmer)*

40. Did you enter aviation training through the NAVCAD Program? (Check one)

☐ (1) YES ☐ (2) NO

41. Prior to entering Aviation Officer Candidate School, did you participate in any of the following programs?
(Circle one number for each line)

	YES	NO
(a) Officer Candidate Prep School	1	2
(b) Aviation Officer Candidate Prep School	1	2
(c) Navy Junior Reserve Officer Training Corps	1	2
(d) Project BOOST	1	2
(e) Tadpole Swim Program	1	2

42. **When did you first develop a serious interest in joining the U.S Armed forces? (Check one)**

- ☐ (1) as a young child
- ☐ (2) in high school
- ☐ (3) in college
- ☐ (4) after graduating from college

43. **When did you first develop a serious interest in joining the Navy?**

- ☐ (1) as a young child
- ☐ (2) in high school
- ☐ (3) in college
- ☐ (4) after graduating from college

44. **When did you first develop a serious interest in becoming an aviator?**

- ☐ (1) as a young child
- ☐ (2) in high school
- ☐ (3) in college
- ☐ (4) after graduating from college

45. **How influential were the following in stimulating your interest in becoming a Naval aviator?**

(Circle one number for each line)

	NOT INFLUENTIAL	SOMEWHAT INFLUENTIAL	VERY INFLUENTIAL
(A) Navy recruiter	1	2	3
(B) Media Advertisements	1	2	3
(C) Blue and Gold Team	1	2	3
(D) Blue Angels	1	2	3
(E) Relative in military aviation	1	2	3
(F) Relative in commercial aviation	1	2	3
(G) Friend in military aviation	1	2	3
(H) Friend in commercial aviation	1	2	3
(I) Friend in ROTC	1	2	3

46. Prior to entering Aviation Officer Candidate School, did you have any previous Armed Forces experience?

☐ (1) Yes ☐ (2) No

If yes, check branch:

☐ (1) Air Force ☐ (2) Army ☐ (3) Coast Guard ☐ (4) Marines ☐ (5) Navy

If yes, how many years did you serve? ________

47. Have any of the following members of your family or friends served in the U.S. Armed Forces?

(Circle as many as apply)

	NAVY	AIR FORCE	ARMY	MARINES
(A) Parent(s)	1	2	3	4
(B) Sibling(s)	1	2	3	4
(C) Grandparent(s)	1	2	3	4
(D) Other relatives	1	2	3	4
(E) Friends	1	2	3	4

8. Are any members of your family: (Circle one)

	YES	NO
(A) Navy aviators	1	2
(B) Air Force aviators	1	2
(C) Army aviators	1	2
(D) Marine aviators	1	2
(E) Coast Guard aviators	1	2
(F) Enlisted air crew members	1	2
(G) Civil Air Patrol aviators	1	2
(H) Civilian aviators	1	2

49. Which aviation program are you enrolled in? (Check one)

☐ (1) Student Naval Pilot (SNP)

☐ (2) Student Naval Flight Officer (SNFO)

☐ (3) Aviation Intelligence

☐ (4) Aviation Maintenance

50. How important was each of the following in influencing your program assignment?

(Circle one number for each line)

	NOT IMPORTANT	SOMEWHAT IMPORTANT	VERY IMPORTANT
(A) My AQT/FAR scores	1	2	3
(B) Personal preference	1	2	3
(C) Physical requirements	1	2	3
(D) Recommendation of recruiter	1	2	3
(E) Recommendation of relative or friend in the Navy	1	2	3

51. Prior to entering Aviation Officer Candidate School, did you have previous flying experience? (Check one)

- ☐ (1) Yes
- ☐ (2) No (Skip to Question 56)

52. Do you have a private pilot's license?

- ☐ (1) Yes
- ☐ (2) No

53. What type of FAA certification do you have? ______________________________

54. Approximately how many hours of flight time have you logged? _______

55. Was your previous flying experience primarily (CHECK ONE)

- ☐ (1) recreational
- ☐ (2) work related
- ☐ (3) preparation for a career in military aviation
- ☐ (4) preparation for a career in civilian aviation

56. During the recruitment process, that is, before you were accepted and actually entered Aviation Officer Candidate School about how many Navy officers did you talk to? _______

57. Among this group, how many of the officers whom you talked to were

- ☐ (A) White? (Write in number) _______
- ☐ (B) Black? (Write in number) _______
- ☐ (C) Hispanic? (Write in number) _______
- ☐ (C) Asian? (Write in number) _______

58. Which aspect of aviation training do you expect to give you the MOST DIFFICULTY? (CHECK ONE)

- ☐ (1) physical demands
- ☐ (2) academic subject matter
- ☐ (3) military discipline
- ☐ (4) psychological stress
- ☐ (5) cockpit performance
- ☐ (6) swimming requirements
- ☐ (7) other (write in) ______________________________

59. Which aspect of aviation training do you expect to give you the LEAST DIFFICULTY? (CHECK ONE)

- ☐ (1) physical demands
- ☐ (2) academic subject matter
- ☐ (3) military discipline
- ☐ (4) psychological stress
- ☐ (5) cockpit performance
- ☐ (6) swimming requirements
- ☐ (7) other (write in) ______________________________

60. Which of the following activities do you participate in on a regular basis either for pleasure or to maintain physical conditioning?

(CHECK AS MANY AS APPLY)

- ☐ (1) Swimming
- ☐ (2) Bowling
- ☐ (3) Weightlifting
- ☐ (4) Volleyball
- ☐ (5) Baseball/Softball
- ☐ (6) Basketball
- ☐ (7) Football/Rugby
- ☐ (8) Running
- ☐ (9) Exercise (*e.g.*, aerobic)
- ☐ (10) Track and Field Activities
- ☐ (11) Boating
- ☐ (12) Golf
- ☐ (13) Bicycling
- ☐ (14) Tennis/Racquetball
- ☐ (15) Calisthenics
- ☐ (16) Skiing
- ☐ (17) Soccer
- ☐ (18) Gymnastics
- ☐ (19) Hockey
- ☐ (20) Archery
- ☐ (21) Pool
- ☐ (22) Table Tennis

61. How would you rate your swimming ability? (check one)

- ☐ (1) above average
- ☐ (2) about average
- ☐ (3) below average

62. If you had to, what is the longest distance you think you would be able to run today? ________ (miles)

63. At which of the following Aviation Medical Facilities were you last examined before coming to NAS Pensacola? (CHECK ONE)

- ☐ (1) USNA Annapolis
- ☐ (2) NAS Corpus Christi
- ☐ (3) NAS Glenview
- ☐ (4) NAS Key West
- ☐ (5) MCAS Beaufort
- ☐ (6) NAS North Island
- ☐ (7) NAS Pt Mugu
- ☐ (8) NAS Dallas
- ☐ (9) NAS Kingsville
- ☐ (10) NAS Jacksonville
- ☐ (11) NAS Memphis
- ☐ (12) NAF Detroit
- ☐ (13) NAS Alemeda
- ☐ (14) NAS Cecil Field
- ☐ (15) NAS Brunswick
- ☐ (16) NAVSTA Norfolk
- ☐ (17) NAS Lemoore
- ☐ (18) MCAS(H) Tustin
- ☐ (19) MEPPS Station
- ☐ (20) NAS New Orleans
- ☐ (21) NAS South Weymouth
- ☐ (22) NAS Moffett Field
- ☐ (23) MCAS Quantico
- ☐ (24) NAS Whidbey Island
- ☐ (25) NAS Miramar
- ☐ (26) MCAS El Toro
- ☐ (27) NAS Chase Field
- ☐ (28) MCAS Yuma
- ☐ (29) NAS Willow Grove
- ☐ (30) NAF El Centro
- ☐ (31) NAS Whiting Field
- ☐ (32) NAS Atlanta
- ☐ (33) NAS Meridian
- ☐ (34) MCAS Cherry Point
- ☐ (35) MCAF Camp Pendleton
- ☐ (36) NAS Oceana
- ☐ (37) NAMI
- ☐ (38) Other (write in) ______________________

64. How do you feel about each of the following statements?

(Circle one number for each line)

	AGREE STRONGLY	AGREE	DISAGREE	DISAGREE STRONGLY
(A) If I left the Navy tomorrow, I think it would be very difficult to get a job in private industry with pay, benefits, duties, and responsibilities comparable with those of the Navy job job that I am being trained for	1	2	3	4
(B) I take a positive attitude toward myself	1	2	3	4
(C) A Naval Air Station seems to be a desirable place to live	1	2	3	4
(D) There is no better feeling than working as long and as hard as one can	1	2	3	4
(E) I usually feel uncomfortable in settings where other people are not like me	1	2	3	4
(F) I will be very disappointed if I don't graduate from Aviation Officer Candidate School	1	2	3	4
(G) I am concerned that I won't be able to express my individuality in the Navy	1	2	3	4
(H) I definitely intend to make the Navy a career	1	2	3	4
(I) I am confident that I have the ability to make it through naval aviation training	1	2	3	4
(J) When I came to Pensacola I feel I had a clear idea of what training would be like	1	2	3	4
(K) If for some reason I don't succeed in aviation, I would still like to make a career in the Navy	1	2	3	4
(L) People who accept their condition in life are happier than those who try to change things	1	2	3	4
(M) I am worried that the Navy will require me to participate in too many things that are not related to the job that I am being trained for	1	2	3	4

(Circle one number for each line)

		AGREE STRONGLY	AGREE	DISAGREE	DISAGREE STRONGLY
(N)	The information I recieved from my Naval advisors provided me with a clear sense of what to expect at the Aviation Training School	1	2	3	4
(O)	I feel that discipline in today's Navy is too strict	1	2	3	4
(P)	What happens to me is my own doing	1	2	3	4
(Q)	Good luck is more important than hard work for success	1	2	3	4
(R)	When I have failed at something it's hard for me to get back on track	1	2	3	4
(S)	At times I think I am no good at all	1	2	3	4
(T)	I don't expect naval aviation training to be any more difficult than college	1	2	3	4
(U)	When I make plans, I am almost certain I can make them work	1	2	3	4
(V)	After getting my wings, I expect that most of my time will be spent flying	1	2	3	4
(W)	I feel I do not have much to be proud of	1	2	3	4
(X)	My parents seldom had to discipline me when I was growing up	1	2	3	4
(Y)	I am able to do things as well as most other people	1	2	3	4
(Z)	Planning only makes a person unhappy, since plans hardly ever work out anyway	1	2	3	4
(AA)	I usually make a good impression in interviews	1	2	3	4
(BB)	If opportunities were better in civilian life I probably would not have joined the Navy	1	2	3	4
(CC)	In group discussions I can usually persuade people to see it my way	1	2	3	4
(DD)	I am often shy with professors and employers	1	2	3	4
(EE)	When I was in college I seldom got behind in my assignments	1	2	3	4
(FF)	Compared to other people, I don't complain much when I am hurt	1	2	3	4
(GG)	Every time I try to get ahead, something or somebody stops me	1	2	3	4
(HH)	I get upset when my professor or boss is angry at me	1	2	3	4

(Circle one number for each line)

		AGREE STRONGLY	AGREE	DISAGREE	DISAGREE STRONGLY
(II)	An individual can get more of an even break in civilian life than in the Navy	1	2	3	4
(JJ)	On the whole, I am satisfied with myself	1	2	3	4
(KK)	I learn more from having my mistakes pointed out than from having my successes praised	1	2	3	4
(LL)	Compared to other people I don't mind taking orders	1	2	3	4
(MM)	I feel I am a person of worth, on an equal plane with others	1	2	3	4
(NN)	My performance is generally at its best when other people are watching	1	2	3	4
(OO)	I prefer to do the job myself rather than share the responsibility for getting it done	1	2	3	4
(PP)	I am often one of the quieter people in a group	1	2	3	4
(QQ)	I try hard never to make a mistake	1	2	3	4
(RR)	Popularity has never been a very important goal of mine	1	2	3	4
(SS)	When there are time pressures, my performance often suffers	1	2	3	4
(TT)	There are times when you should just assume that your first try will be wrong, but you will learn from your mistakes	1	2	3	4
(UU)	I enjoy the challenge of having deadlines to meet	1	2	3	4
(VV)	I generally prefer to spend my free time alone	1	2	3	4
(WW)	I did not get along with my parents as well as most children do	1	2	3	4
(XX)	The person who makes a good first impression is often not the best choice	1	2	3	4
(YY)	Sometimes the best way to deal with a difficult situation is with a joke	1	2	3	4
(ZZ)	People who act very self-confident often seem cocky to me	1	2	3	4
(AB)	My parents wanted me to join the military	1	2	3	4
(AC)	One of the most difficult things in life is setting priorities and adjusting your schedule to meet them	1	2	3	4

65. Below is a list of some of the things the Navy has to offer. How important was each of the following in influencing your decision to join the Navy?

(Circle one number for each line)

	NOT IMPORTANT	SOMEWHAT IMPORTANT	VERY IMPORTANT
(A) Travel opportunities	1	2	3
(B) Opportunity to serve and defend your country	1	2	3
(C) Chance to work with state-of-the-art technology	1	2	3
(D) Opportunity to serve under skilled and experienced officers	1	2	3
(E) Opportunity to gain experience as a manager and a leader	1	2	3
(F) Chance to become a member of an important team	1	2	3
(G) Chance to develop skills to prepare myself for a civilian career	1	2	3
(H) Chance to become an aviator	1	2	3
(I) Opportunity for adventure	1	2	3
(J) Secure economic opportunities	1	2	3
(K) Educational opportunities	1	2	3

APPENDIX B

Sample Interview Schedules

FLIGHT INSTRUCTOR INTERVIEW SCHEDULE

I. INTRODUCTION

Hello, I am __________ and this is __________, and we are PhD research scientists from Johns Hopkins University. Our experience and research specialty is in organizational effectiveness and training.

As you well know, the Navy faces severe strains in meeting its needs for aviators to "staff" the 600 ship Navy. Attrition from aviation training, attrition among experienced aviators, increased competition from the civilian airlines, expanding opportunities related to growth in the civilian economy, and a declining pool of college trained males with high-tech specialties are all potential sources of manpower shortages.

Our research team from Johns Hopkins University has been contracted by the Navy to find possible ways to increase the productivity of Naval Aviation Training to attain both its current and projected "manning" goals in today's changing demographic market, while maintaining the overall quality of naval aviation officers.

We will be doing a lot of complex statistical analyses of training data to examine risk and success factors in training. However, we are also talking to a number of people in both operational settings and in the training command about their own experiences during and subsequent to training to learn

what ideas they may have about how to increase training productivity. As aviators who have successfully completed the aviation training program, and who have the benefit of operational fleet experience, we would like your advice about how these potential problems can be met.

Your responses to all questions will be treated confidentially. Reports based on this research will only reflect overall patterns from our interviews here and at other sites in Texas, California and Virginia. Individual responses will not be reported.

Before we begin, we would like you to introduce yourselves. We'll ask you to complete a brief background information card at the end of the interview, but for now, in two or three brief sentences, please tell us WHO YOU ARE, WHAT YOUR CURRENT JOB IS, and HOW LONG YOU'VE BEEN IN THE NAVY?

TIME:____________________

II. CHARACTERISTICS OF GOOD PILOTS(NFO's)

In a few minutes, we will ask your opinions on several aspects of aviation training, but as background for that it may be useful to think about characteristics of a good pilot(NFO).

(A) In your experience, what are the characteristics which make someone a good pilot (NFO).

(B) We have often been told that "motivation" is an important attribute possessed by successful Naval aviators---Do you feel that this is an important trait? WHY?

PROBE: HOW DO YOU IDENTIFY SOMEONE WHO IS REALLY MOTIVATED?

TIME:____________________

III. TRAINING CURRICULUM

Next, we would like you to focus on the Naval Aviation Training process and how it contributes to the development of good pilots(NFO's)

(A) Looking back to your own experiences from AOCS or API through ADVANCED, what aspects of training would you say were most useful. or least useful (i.e., what has helped you most/least in performing your job as a naval aviator?)

MOST USEFUL? WHY?

LEAST USEFUL? WHY?

(B) As a result of the manpower pipeline problems mentioned earlier. the aviation training command may face the task of reducing training time while maintaining the overall quality of output. We want to know: If YOU had to reduce training time, what modifications would YOU make? Here is a sample syllabus reflecting the current requirements in aviation training. (HAND OUT CURRICULUM CARD)

We are going to ask you to indicate which elements you feel could receive less emphasis and which should receive more emphasis.

First think about the major segments of training, identified on the card with circles. In those circles indicate with a (-) any major segments that could be emphasized less and with a (+) any major segments that should be emphasized more. Leave the circle blank if the training time for that major segment seems about right.

Then take another 2 or 3 minutes to go back and consider individual components, identified with squares. In those squares, indicate with a (-) any individual components which could be emphasized LESS and with a (+) any individual components which should be emphasized MORE. Again, leave the square blank where training time for that individual component seems about right.

Remember, the goal is to reduce training time without diminishing the quality of the product.

PROBE:

Did anyone place a (-) in Section I (AOCS/API)? Why?

Did anyone place a (-) in Section II (PRIMARY/BASIC)? Why?

Did anyone place a (-) in Section III (INTERMEDIATE)? Why?

Did anyone place a (-) in Section IV (ADVANCED)? Why?

TIME:________________

SAMPLE

Aviation Training Hours Summary

SECTION I

AVIATION OFFICER CANDIDATE SCHOOL (AOCS)/AVIATION PREFLIGHT INDOCTRINATION (API)

Academic Training -- 325 total hours
- Administration (19)
- U. S. Seapower (24)
- Navigation (25)
- Organization (14)
- Seamanship (16)
- Student Info (6)
- Military Law (17)
- Naval Leadership (25)
- Engineering (16)
- Aerodynamics (20)

Military Training -- 433 total hours
- Applied Leadership (61)
- Military Inspections(10)
- Physical Fitness (92)
- Arms Training & Parade (83)
- Personnel & Material Inspections (158)
- Policy Lectures (12)
- Officer-like Qualities, Peer Rating & Counseling (7)

Survival Training -- 168 total hours
- Aviation Physiology (32)
- Academics (16)
- Land Survival (62)
- Swimming (30)
- Physical Fitness (20)
- Deep Water Survival (8)

AVIATION PREFLIGHT INDOCTRINATION (APFI) for non-AOCS Students

Academic Training -- 85 total hours
- Navigation (25)
- Student Info (8)
- Engineering (16)
- Aerodynamics (20)
- Learning Center (14)
- Alcohol Drug Guidance [illegible]

Survival Training -- 168 total hours
- Aviation Physiology (32)
- Swimming (30)
- Land Survival (52)
- Deep Water Survival (8)
- Physical Fitness (23)
- Academics (16)

SECTION II

PRIMARY (All Pilots -- Jet, Maritime and Helicopter)

Flight Training -- 66.4 total hours
- Familiarization (24.0)
- Formation (11.4)
- Precision Landings, Aerobatics (8.4)
- Night FAM (2.6)
- Basic Instruments (7.2)
- Radio Instruments (11.8)

Synthetic Instrument Training -- 26.8 total hours
- Procedures Trainer (6.0)
- Basic Instruments (10.4)
- Radio Instruments (10.4)

Flight Support -- 43.5 total hours
- Course Rules (6.0)
- Safety (1.0)
- Bailout Trainer (2.3)
- Preflight (3.0)
- Emergency Procedures (6.5)
- FAM Flight 0 (3.0)
- Safe for Solo (2.0)
- Formation (1.0)
- Flight Procedures (21.0)

Academics -- 122.8 total hours
- Engineering (26.5)
- Aerodynamics (11.5)
- Flight Rules (5.3)
- Meteorology (40.3)
- Instrument Navigation (41.5)

Aviation Training Hour Summary (Pilots)

SECTION III

INTERMEDIATE MARITIME AND HELICOPTER FLIGHT TRAINING

Flight Training -- 26.0 hours
- Radio Instruments (10.0)
- Night Navigation (3.0)
- Day Navigation (5.0)
- Airways Navigation (8.0)

Flight Instrument Trainer (2837) -- 10.4 hours

Instrument Simulator ...
- Radio Instruments (7.8)
- Airways Navigation (2.6)

Flight Support -- 7.0 hours
- Radio Instruments (1.0)
- Night Navigation (2.0)
- Day Navigation (2.0)
- Night Navigation Exam (1.0)
- Day Navigation Exam (1.0)

SECTION IV

ADVANCED MARITIME ONLY

Flight Training -- 87.5 hours
- Familiarization (17.9)
- Radio Instruments (43.[illegible])
- Basic Instruments (7.5)
- Airways Navigation (13.[illegible])
- Night Familiarization (5.9)

Operational Flight Trainers -- 19.5 hours
- Basic Instruments (6.0)
- Radio Instruments (13.5)

Flight Support -- 43.7 hours
- Preflight (4.0)
- Cockpit Procedures Trainer [illegible]
- Flight Procedures (18.0)
- Audio Visual [illegible]

Academic Training -- 138.0 hours
- Indoctrination (4.0)
- Aircraft Systems [illegible]
- Dead Reckoning (38.5)
- Aerodynamics (6.[illegible])
- Aircraft Rules & Regulations (4.5)
- Instrument Navigation (26.5)
- Flight Rules & Regulations (5.0)
- Meteorology [illegible]

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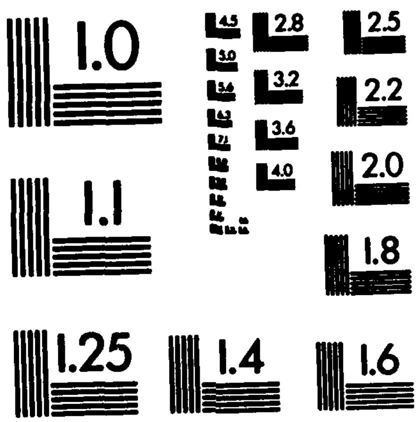
1.0
2.8
2.5
3.2
2.2
3.6
4.0
2.0
1.1
1.8
1.25
1.4
1.6

IV. ATTRITION ISSUES

Next,we would like to ask you to think about the problem of attrition from Naval Aviation Training.

First, we would like to know if any of you have ever served on a Student Disposition Board?

What seems to be the major considerations in determining the outcome of Board decisions (i.e., what factors are counted most heavily)?

Was there ever a Board decision--"pass or fail"--that you did not agree with? Why?

Did you ever give a "down" to someone who had the makings of a competent aviator?

In your opinion, what are the main reasons student naval aviators DOR?

Can you think of examples of students who attrited, but probably should never have been accessed at all?

Can you think of examples of students who attrited, whom you thought were borderline cases and may have made good aviators? {PLEASE DON'T MENTION ANYONE BY NAME!} Why did they attrite?

Do some students get attrited for being too slow (i.e., not being able to master the syllabus at a fast enough pace even though they probably had the "ability" to complete, if the pace were slower)?

TIME:________________

V. ADDITIONAL QUESTIONS FOR FLIGHT AND PLATFORM INSTRUCTORS

Next, we would like to ask you a few general questions about YOUR JOB.

(1) Based on your overall experience as a naval officer and flight instructor how would you rate the overall performance of student pilots (NFO's) with whom you've had contact in recent years?

(2) Can you single out any major shortcomings of student pilots (NFO's) coming into the Navy today?

(3) Conversely can you identify any major strengths of student pilots (NFO's) coming into the Navy today?

(4) Before taking on a new class of students do you look at student records?

a) What do you look for?

b) Why do yo feel its important to examine records?

c) For the last student you gave a "down" did you see anything in his/her records that alerted you to potential risk prior to take off?

d) If so, what?

LET'S FOCUS ON YOUR JOB IN MORE DETAIL.

(5) What would you say is the most important part of your job?

PROBE: What is the primary mission of a flight/platform instructor--TO TEACH? TO EVALUATE?)

PROBE: In performing your duties as an instructor, do you feel there exists an appropriate balance in the time you devote to instruction and students and the time you devote to routine administrative tasks?

a) If balance not appropriate, how could it be made so?

PROBE: Do you feel that the effiency of aviation instruction could be improved by seperating the teaching and evaluation functions. (In other words, by tasking some instructors to "coach" students in developing flight skills and tasking other instructors to evaluate student proficiency in specific skill areas)?

(6) What special training did you undergo in preparation for this assignment as an Instructor?

a) Did your preparation for this assignment include extra flight training? Was this training adequate?(why/why not)

b) Did your preparation for this assignment include training in how to teach? Was this training adequate?(why/why not)

c) Did your preparation for this assignment include human relations training? Was this training adequate?(why/why not)

d) Do you have any suggestions for improvements in the training of (flight/navigational) instructors?

(7) With regard to your Navy career, do you consider THIS instructional billet as career enhancing or desirable?

a) What are major advantages professionally?

b) What are major disadvantages professionally?

(8) What would you think about the use of civilian "contract" instructors in Navy flight training?

a) What are advantages?

b) What are disadvantages?

TIME:___________

VI. OTHER POTENTIAL TRAINING/RECRUITMENT/SELECTION ISSUES

(A) Let's, change the focus of the discussion a bit. Everyone agrees that the Navy currently trains top quality aviators, but there is always the possibility of making a good thing better. For example, in recent years the Navy had been losing aviation trainees as a direct or indirect result of swimming difficulties. However, as a consequence of implementing an innovative pre-swim component in the training syllabus it now appears that future losses of this kind are highly unlikely.

We are now trying to look at the complex training process, and identify other areas where these types of initiatives might be developed. We have talked a lot about curriculum issues, but we want you to step back for a moment and think about the broad experiences one encounters during training.

Based on data from the training command and other research, we will ask your opinions about 6 or 7 potential areas where modifications might be made in the overall aviation recruitment, selection and training process. To facilitate discussion, we will ask you to react to several broad statements: HERE IS THE FIRST STATEMENT:

(1) Training efficiency is impaired and many students are hurt by dead time or interruptions in the flow of training. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(2) Students who don't get together and study with their classmates have more difficulty passing the requirements of aviation training. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(3) As currently structured, some academic courses are too abstract and could be made a lot more useful if they integrated theory with practical applications. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(4) Aviation training could be made a lot more efficient by using more state-of-the-art equipment and through a greater reliance on simulator training. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(5) I've heard it said that many times you can tell within the first couple of days of training whether someone will make it or not? DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(6) In aviation training, sometimes a student might fail with one instructor when he could have passed with another instructor. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

PROBE: If instructors in the training command were given more training in how to teach, training effectiveness could improve.

(7) Granted, that the jobs of naval aviators requires working as members of a team, sometimes under stressful conditions, however, many feel that naval aviation training could be made a lot less emotionally stressful, and still be effective and prepare students for the ACTUAL stresses of aviation operations. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(8) An accurate profile of a successful naval aviation "student" would be someone under 25 years of age; has 20/20 uncorrected vision; high scores on the AQT/FAR examination, has earned at least a four-year college degree; majored in a scientific or technical field; and, has had civilian flight experience.

As I read these off again, tell me whether these requirements are necessary for a student to successfully complete Aviation Training.

(a) Is it necessary to have entered the Navy before 25 in order to successfully complete aviation training?

(b) Is it necessary to have 20/20 uncorrected vision in order to successfully complete aviation training?

(c) Is it necessary to have a four-year college degree in order to successfully complete aviation training?

(d) Is it necessary to have majored in a technical field in order to successfully complete aviation training?

(e) Is it necessary to have high AQT/FAR scores in order to successfully complete aviation training?

(f) How useful is it to have civilian flight experience in order to successfully complete aviation training?

PROBE: Just as the pre-swim program has helped improve the efficiency of naval aviation training, in a similar vein. some type of pre-flight (or other) training before AOCS/AI could improve the odds of completing naval aviation training. (study skills,. military orientation, basic science/ any other?)

TIME:________________ HAND OUT BACKGROUND QUESTIONNAIRE

BACKGROUND INFORMATION CARD

(1) Aviation Community and Designator________________________

(2) Commissioning Source________________________

(3) Present Rank________________________

(4) Name of Undergraduate College________________________

(5) Undergraduate Major Field________________________

(6) Did you have civilian flight experience prior to entering naval aviation?________________________

(7) Ever involved in an aviation accident of any kind____________

(8) Number of full deployments you have had in naval aviation____

(9) Number of flight hours________________________

(10) When did you get your wings?________________________

(11) Do you plan to make the Navy a career?________________________

(12) What members of your immediate family have served as a military aviator?________________________

(13) What other members of your immediate family have served in the military?________________________

(14) If you have any other suggestions for improving Naval Air Training, please write them here.________________________

____

____

Your Name____

REVIEW BOARD PROCESS (CONFIDENTIAL): ATTRITION

Please think about the last board you served on in which a student was attrited. Without naming the student, please answer these questions:

1. When that board began, did you believe that the student would be attrited? Why?

2. What material in the student's jacket made you think that the student should be attrited?

3. What material in the student's jacket made you think that the student should not be attrited?

4. Did all of the board members agree from the beginning that the student should be attrited, or did some of them have to be convinced?

5. What was the most important argument in persuading board members that the student should be attrited?

6. Did the student say or do anything during the hearing to convince you that attrition was the right decision?

7. Did the student say or do anything to make you consider deciding against attrition? another chance?

8. How would you describe the student's attitude?

9. Had you ever flown a hop with this student? If not, had you met the student in some other context?

REVIEW BOARD PROCESS (CONFIDENTIAL): NON-ATTRITION

Please think about the last board you served on where a student was not attrited. Without naming the student, please answer these questions:

1. When that board began, did you believe that the student would be attrited? Why?

2. What material in the student's jacket made you think that the student should be attrited?

3. What material in the student's jacket made you think that the student should <u>not</u> be attrited?

4. Did all of the board members agree from the beginning that the student should not be attrited, or did some of them have to be convinced?

5. What was the most important argument in persuading board members that the student should not be attrited?

6. Did the student say or do anything during the hearing to convince you that the student should not be attrited?

7. Did the student say or do anything to make you think that attrition was the appropriate decision?

8. How would you describe the student's attitude?

9. Had you ever flown a hop with this student? If not, had you met the student in some other context?

DESCRIPTION OF CHECKHOP DECISION--NO DOWN

Think about the last student to whom you gave a low grade without giving a down. (Do not write the student's name.)

1. What was the student's major problem in this flight?

2. Were there other problems?

3. What were the strong parts of the student's performance?

4. Check one:
   1. I considered giving a down but decided not to. ___
   2. I never considered giving a down. ___

   If you checked "1" why did you decide not to give a down?

5. Had you looked in the student's jacket before the flight?
   yes___no___

6. How many times had you flown with the student before? _____

7. Had you talked with another instructor about the student?
   yes___no___

8. Did you expect this student to have difficulty with this hop?
   yes___no___ Why?

9. Do you think the student will finish flight school or will the student attrite? (check: finish____ attrite____)

   Why do you think that?

DESCRIPTION OF CHECKHOP DECISION--DOWN

Think about the last student to whom you gave a down. (Do not write the student's name.)

1. What was the student's major problem in this flight?

2. Were there other problems?

3. What were the strong parts of the student's performance?

4. At what point in the flight did you first think you would have to give the student a down? (Check one)

   beginning _____ middle ______ end _____

5. Had you looked in the student's jacket before the flight?
   yes___no___

6. How many times had you flown with the student before? _____

7. Had you talked with another instructor about the student?
   yes___no___

8. Did you expect this student to have difficulty with this hop?
   yes___no___ Why?

9. Do you think the student will finish flight school or will the student attrite? (check: finish____ attrite____)

   Why do you think that?

API & ADVANCED SNP/SNFO INTERVIEW SCHEDULE

I. INTRODUCTION

Hello, I am ___________ and this is ___________, and we are PhD research scientists from Johns Hopkins University. Our experience and research specialty is in organizational effectiveness and training.

As you well know, the Navy faces severe strains in meeting its needs for aviators to "staff" the 600 ship Navy. Attrition from aviation training, attrition among experienced aviators, increased competition from the civilian airlines, expanding opportunities related to growth in the civilian economy, and a declining pool of college trained males with high-tech specialties are all potential sources of manpower shortages.

Our research team from Johns Hopkins University has been contracted by the Navy to find possible ways to increase the productivity of Naval Aviation Training to attain both its current and projected "manning" goals in today's changing demographic market, while maintaining the overall quality of naval aviation officers.

We will be doing a lot of complex statistical analyses of training data to examine risk and success factors in training. However, we are also talking to a number of people in both operational settings and in the training command about their own experiences during and subsequent to training to learn

what ideas they may have about how to increase training productivity. However, AS ADVANCED STUDENTS WHO HAVE SUCCESSFULLY COMPLETED MOST OF THE AVIATION TRAINING SYLLABUS, {FOR API: As Students Beginning The Aviation Training Program} we would also like your advice about how these potential problems can be met.

Your responses to all questions will be treated confidentially. Reports based on this research will only reflect overall patterns from our interviews here and at other sites. Individual responses will not be reported.

Before we begin, we would like you to introduce yourselves. We'll ask you to complete a brief background information card at the end of the interview, but for now, in two or three brief sentences, please tell us WHO YOU ARE, WHERE YOU ATTENDED COLLEGE, YOUR MAJOR FIELD, and WHAT PROGRAM YOU'RE IN.

TIME:____________________

II. CHARACTERISTICS OF GOOD PILOTS(NFO's)

In a few minutes, we will ask your opinions on several aspects of aviation officer training, but as background for that it may be useful to think about characteristics that make a good pilot (NFO).

(A) In your judgement, and based on your experience, what are the characteristics which make someone a good pilot (NFO)?

(B) What are special characteristics of the very best pilots (NFO's)?

PROBE: Why do you feel those are important traits? Any others?

We have often been told that "motivation" is an important attribute possessed by successful pilots (NFO's)----Do you feel that this is an important factor?

PROBE: How do you identify someone who is really motivated?

TIME:____________________

III. TRAINING CURRICULUM

Next, we would like you to focus on the Naval Aviation Training process and how it contributes to the development of good Naval Aviators.

(A) Based on your experiences in aviation training, which components of your training gave you the Most Difficulty, Least Difficulty?

MOST DIFFICULT? WHY?

LEAST DIFFICULT? WHY?

And which components of your training need improvement?

NEED IMPROVEMENT? WHY?

PROBE: How should they be modified?

(B) As a result of the manpower pipeline problems mentioned earlier, the aviation training command may face the task of reducing training time while maintaining the overall quality of output. We want to know: If YOU had to reduce training time, what modifications would YOU make? We are going to hand you a sample syllabus reflecting the current requirements in AOCS/API through ADVANCED: (HAND OUT CURRICULUM CARD)

We are going to ask you to indicate which elements you feel could receive LESS emphasis and which should receive MORE emphasis.

First, think about the <u>major segments</u> of training, identified on the card with <u>circles</u>. In those circles, indicate with a (-) any major segments that could be emphasized less and with a (+) any major segments that should be emphasized more. Leave the circle blank if the training time for that segment seems about right.

Then take another 2 or 3 minutes to go back and consider <u>individual components</u>, identified with <u>squares</u>. In those squares, indicate with a (-) any individual components that could be emphasized LESS and with a (+) any individual components which should be emphasized MORE. Again, leave the square blank where training time seems about right.

Remember, the goal is to reduce training time without diminishing the quality of the product.

PROBE:

Did anyone place a (-) in Section I (AOCS / API)? Why?

Did anyone place a (-) in Section II (PRIMARY / BASIC)? Why?

Did anyone place a (-) in Section III (INTERMEDIATE)? Why?

Did anyone place a (-) in Section IV (ADVANCED)? Why?

TIME:________________

IV. ATTRITION ISSUES

Next, we would like to ask you to think about the problem of attrition from Naval Aviation Training. Considering the fact that student attrition from aviation training can be voluntary or involuntary we want you to think first of students who Drop on Request (DOR):

In your opinion, what are the main reasons Aviation Officer Candidates DOR?

PROBE: What role, if any, does the DI, class officer or instructor play in DOR's or attrition in general.

In regard to INVOLUNTARY ATTRITION: (A) Can you think of examples of students who attrited, but probably should never have been accessed at all?

(B) Can you think of examples of students who attrited, but probably would have become a good and safe pilot/NFO?

V. OTHER POTENTIAL TRAINING/RECRUITMENT/SELECTION ISSUES

(A) Let's, change the focus of the discussion a bit. Everyone agrees that the Navy currently trains top quality aviators, but there is always the possibility of making a good thing better. For example, in recent years the Navy had been losing aviation trainees as a direct or indirect result of swimming difficulties. However, as a consequence of implementing an innovative pre-swim component in the training syllabus it now appears that future losses of this kind are highly unlikely.

We are now trying to look at the complex training process, and identify other areas where these types of initiatives might be developed. We have talked a lot about curriculum issues, but we want you to step back for a moment and think about the broad experiences one encounters during training.

Based on data from the training command and other research, we will ask your opinions about 6 or 7 potential areas where modifications might be made in the overall aviation recruitment, selection and training process. To facilitate discussion, we will ask you to react to several broad statements: HERE IS THE FIRST STATEMENT:

(1) An accurate profile of a successful naval aviation "student" would be someone under 25 years of age; has 20/20 uncorrected vision; high scores on the AQT/FAR examination, has earned at least a four-year college degree; majored in a scientific or technical field; and, has had civilian flight experience.

As I read these off again, tell me whether these requirements are necessary for a student to successfully complete Aviation Training.

(a) Is it necessary to have entered the Navy before 25 in order to successfully complete aviation training?

(b) Is it necessary to have 20/20 uncorrected vision in order to successfully complete aviation training?

(c) Is it necessary to have a four-year college degree in order to successfully complete aviation training?

(d) Is it necessary to have a technical college major in order to successfully complete aviation training?

(e) Is it necessary to have high AQT/FAR scores in order to successfully complete aviation training?

(f) How useful is it to have civilian flight experience in order to successfully complete aviation training?

PROBE: Just as the pre-swim program has helped improve the efficiency of naval aviation training, in a similar vein, some type of pre-flight (or other) training before AOCS/AI could improve the odds of completing naval aviation training. (study skills,. military orientation, basic science/ any other?)

(2) Training efficiency is impaired and many students are hurt by dead time or interruptions in the flow of training. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(3) As currently structured, some academic courses are too abstract and could be made a lot more useful if they integrated theory with practical applications. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(4) Aviation training could be made a lot more efficient by using more state-of-the-art equipment and through a greater reliance on simulator training. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(5) I've heard it said that you can tell within the first couple of days of training whether someone will make it or not. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(6) Some students get attrited for being too slow (i.e., not being able to master the syllabus at a fast enough pace even though they probably had the "ability" to complete, if the pace were slower). DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(7) Students who don't get together and study with their classmates have more difficulty passing the requirements of aviation training. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

(8) In aviation training, sometimes a student might fail with one instructor when he could have passed with another instructor. DO YOU AGREE OR DISAGREE WITH THAT STATEMENT? Why?

PROBE: Granted, that the jobs of naval aviators requires working as members of a team, sometimes under stressful conditions, however, many feel that naval aviation training could be made a lot less emotionally stressful, and still be effective and prepare students for the ACTUAL stresses of aviation operations.

PROBE: If instructors in the training command were given more training in how to teach, training effectiveness could improve.

VI. ADDITIONAL QUESTIONS FOR MINORITY AVIATORS

Are (Were) you the only minority in your class?

PROBE: Do you see any need for special programs to recruit minority aviators? ANY SUGGESTIONS?

Have you had (Did you have) any minority instructors in Aviation Training?

Has (Did) being a minority aviation officer created any special burdens for you in training?

What were they? How did you deal with them?

PROBE: Does the stereotype of the ideal naval aviator not "fit" minority aviation candidates?

Why do you think minority aviation officer candidates attrite at a higher than average rate?

Are you aware of some examples? Do you know why?

How can the role of minorities in recruitment and instruction be increased without hampering individual career-progress?

TIME:__________

HAND OUT BACKGROUND QUESTIONNAIRE

STUDENT BACKGROUND INFORMATION CARD

(1) What aviation program are you enrolled in?________________

(2) Commissioning Source________________

(3) Present Rank________________

(4) Name of Undergraduate College________________

(5) Undergraduate Major Field________________

(6) How old were you on your last birthday?________________

(7) What is your race (ethnic) identification?________________

(8) Where did you spend most of your life when you were growing-up (i.e., in high school)________________

(9) Did you have civilian flight experience prior to entering naval aviation?________________

(10) Ever involved in an aviation accident of any kind________________

(11) When did you first develop a serious interest in joining the Navy?________________

(12) Do you plan to make the Navy a career?________________

(13) What members of your immediate family have served as a military aviator?________________

(14) What other members of your immediate family have served in the military?________________

(15) If you have any other suggestions for improving Naval Air Training, please write them here.________________

____

____

Your Name________________

Table C5.1 (continued)

	Aviation Officer Candidate School (N=756)		Aviation Preflight Indoctrination USNA (N=103)		Other (N=138)		Total (N=242)	
COMMUNITY TYPE								
Rural area (<1000 pop.)	32	(4.3%)	10	(9.9%)	9	(6.7%)	19	(8.0%)
Small Town (1000-49,000)	298	(40.4%)	35	(34.7%)	59	(43.7%)	95	(40.1%)
Small City (50,000-100,000)	91	(12.3%)	17	(16.8%)	14	(10.4%)	31	(13.1%)
Medium-Sized City (100,000-300,000)	79	(10.7%)	7	(6.8%)	14	(10.4%)	21	(8.9%)
Suburb of medium-sized city	35	(4.7%)	10	(9.9%)	10	(7.4%)	20	(8.4%)
Large city (over 300,000)	81	(11.0%)	7	(6.8%)	7	(5.2%)	14	(5.9%)
Suburb of large city	112	(15.2%)	13	(12.9%)	21	(15.6%)	34	(14.3%)
Military communities	9	(1.2%)	2	(2.0%)	1	(.7%)	3	(1.3%)
MOTHER'S EDUCATION								
H.S. Graduate or less	287	(38.7%)	33	(32.0%)	40	(29.2%)	73	(30.3%)
Some college	189	(25.5%)	23	(22.3%)	34	(24.8%)	57	(23.7%)
BA/BS degree or higher	266	(35.85)	47	(45.6%)	63	(46.0%)	111	(46.1%)
FATHER'S EDUCATION								
H.S. Graduate or less	165	(22.6%)	21	(20.8%)	21	(15.9%)	42	(17.9%)
Some college	147	(20.2%)	16	(15.8%)	24	(18.2%)	40	(17.1%)
BA/BS degree or higher	417	(57.2%)	64	(63.4%)	87	(65.9%)	152	(65.0%)
NUMBER OF SIBLINGS								
None	21	(2.8%)	1	(1.0%)	6	(4.3%)	7	(2.9%)
1-3	586	(77.6%)	82	(79.6%)	103	(74.7%)	185	(76.4%)
4 or more	148	(19.6%)	20	(19.4%)	29	(21.0%)	50	(20.7%)
	Mean=2.52		Mean = 2.51		Mean = 2.57		Mean = 2.55	
	S.D.=1.63		S.D. = 1.24		S.D. = 1.75		S.D. = 1.55	
FAMILY STATUS								
Raised by both parents	677	(89.6%)	96	(94.1%)	126	(91.3%)	223	(92.5%)
Raised by father alone	15	(2.0%)	1	(1.0%)	1	(.7%)	2	(.8%)
Raised by mother alone	60	(7.9%)	5	(4.9%)	10	(7.2%)	15	(6.2%)
Raised by other relatives	3	(.4%)	--	--	1	(.7%)	1	(.4%)

Table C5.1 Demographic Profile of NASC Accessions (May-Sept 1986)

	Aviation Officer Candidate School (N=756)		Aviation Preflight Indoctrination: USNA (N=103)		Aviation Preflight Indoctrination: Other (N=138)		Total (N=242)	
SEX								
Male	736	(97.5%)	97	(94.2%)	135	(97.8%)	233	(96.3%)
Female	19	(2.5%)	6	(5.8%)	3	(2.2%)	9	(3.7%)
RACE/ETHNIC								
White	690	(92.6%)	87	(88.8%)	126	(92.0%)	214	(90.7%)
Hispanic	27	(3.6%)	6	(6.1%)	5	(3.6%)	11	(4.7%)
Black	14	(1.9%)	1	(1.0%)	3	(2.2%)	4	(3.0%)
Asian	13	(1.7%)	4	(4.1%)	-	--	7	--
Indian	1	(.1%)	--	--			--	
AGE								
<22 yrs.	159	(22.0%)	59	(59.6%)	54	(40.0%)	113	(48.1%)
23 yrs.	201	(28.1%)	33	(33.3%)	38	(28.1%)	71	(30.2%)
24 yrs.	134	(18.7%)	3	(3.0%)	16	(11.9%)	19	(8.1%)
25 yrs.	81	(11.3%)	3	(3.0%)	10	(7.4%)	13	(5.5%)
26 yrs.	141	(19.7%)	1	(1.0%)	17	(12.6%)	19	(8.1%)
	Mean = 23.94		Mean = 22.53		Mean = 23.37		Mean = 23.03	
	S.D. = 1.80		S.D. = .79		S.D. = 1.70		S.D. = 1.46	
MARITAL STATUS								
Single	658	(87.2%)	93	(90.3%)	118	(85.5%)	211	(87.2%)
Widowed	1	(.1%)	--	--	--	--	--	--
Separated	1	(.1%)	--	--	1	(.7%)	1	(.4%)
Divorced	6	(.8%)	--	--	1	(.7%)	1	(.4%)
Married	89	(11.8%)	10	(9.7%)	18	(13.0%)	29	(12.0%)
REGION								
North	247	(33.7%)	41	(40.2%)	53	(40.5%)	95	(40.6%)
West	131	(17.8%)	14	(13.7%)	14	(10.7%)	28	(12.0%)
Midwest	161	(21.9%)	25	(24.5%)	29	(22.1%)	57	(24.4%)

Table C5.2 Academic Profile of NASC Accessions (May-Sept 1986)

	Aviation Officer Candidate School (N=756)		Aviation Preflight Indoctrination USNA (N=103)		Aviation Preflight Indoctrination Other (N=138)		Total (N=242)	
EDUCATION LEVEL								
Some college	5	(.7%)	--	--	--	--	--	--
Associates degree	6	(.8%)	--	--	--	--	--	--
BA/BS degree	728	(96.7%)	103	(100.0%)	136	(98.6%)	240	(99.2%)
MA/MS degree	12	(1.6%)	--	--	2	(1.4%)	2	(.8%)
Ph.D., M.D., J.D., or other professional degree	2	(.3%)			--	--	--	--
MAJOR FIELD								
Technical	344	(45.5%)	86	(83.5%)	64	(46.4%)	150	(62.0%)
Non-technical	412	(54.5%)	17	(16.5%)	74	(53.6%)	92	(38.0%)
COLLEGE GRADES (Four-Point Scale)	Mean=2.85 S.D.=.41		Mean=2.69 S.D.=.39		Mean=2.84 S.D.=.35		Mean=2.78 S.D.=.38	
CLASS RANK								
Upper 5%	25	(3.4%)	4	(3.9%)	2	(1.5%)	7	(3.0%)
Upper 10%	71	(9.8%)	2	(1.9%)	14	(10.6%)	16	(6.8%)
Upper 25%	233	(32.0%)	15	(14.6%)	41	(31.1%)	56	(23.7%)
Upper 50%	303	(41.7%)	31	(30.1%)	57	(43.2%)	88	(37.3%)
Lower 50%	95	(13.1%)	51	(49.5%)	18	(13.6%)	69	(29.2%)
COLLEGE HOMEWORK (Hours/Week)	Mean=18.00 S.D.=10.29		Mean=23.19 S.D.=8.08		Mean=19.56 S.D.=9.34		Mean=21.16 S.D.=8.96	

Table C5.2 (continued)

	Aviation Officer Candidate School (N=756)		Aviation Preflight Indoctrination USNA (N=103)		Aviation Preflight Indoctrination Other (N=138)		Total (N=242)	
SCIENTIFIC & TECHNICAL COURSES IN COLLEGE (Number of Courses)								
Physical Sciences								
None	29	(3.9%)	--	--	4	(2.9%)	5	(2.1%)
1-2	200	(26.7%)	14	(13.7%)	26	(18.8%)	40	(16.6%)
3-5	238	(31.8%)	42	(41.2%)	64	(46.4%)	106	(44.0%)
6 or more	281	(37.6%)	46	(45.1%)	44	(31.9%)	90	(37.3%)
Mathematics/Statistics								
None	9	(1.2%)	--	--	1	(.7%)	2	(.8%)
1-2	135	(18.0%)	--	--	12	(8.8%)	12	(5.0%)
3-5	328	(43.8%)	43	(41.7%)	70	(51.1%)	113	(46.9%)
6 or more	277	(37.0%)	60	(58.3%)	54	(39.4%)	114	(47.3%)
Computer/Info Sciences								
None	104	(14.0%)	--	--	16	(11.8%)	17	(7.1%)
1-2	355	(47.7%)	63	(61.2%)	74	(54.4%)	137	(57.1%)
3-5	177	(23.8%)	28	(27.2%)	33	(24.3%)	61	(25.4%)
6 or more	109	(14.6%)	12	(11.7%)	13	(9.6%)	25	(10.4%)
Engineering								
None	404	(54.4%)	--	--	49	(36.0%)	50	(20.8%)
1-2	106	(14.3%)	2	(1.9%)	30	(22.1%)	32	(13.3%)
3-5	54	(7.3%)	25	(24.3%)	12	(8.8%)	37	(15.4%)
6 or more	179	(24.1%)	76	(73.8%)	45	(33.1%)	121	(50.4%)
Aeronautics/Aviation								
None	526	(71.3%)	44	(44.4%)	95	(70.9%)	140	(59.8%)
1-2	85	(11.5%)	40	(40.4%)	28	(20.9%)	68	(29.1%)
3-5	31	(4.2%)	6	(6.1%)	2	(1.5%)	8	(3.4%)
6 or more	96	(13.3%)	9	(9.1%)	9	(6.7%)	18	(7.7%)

Table C5.2 (continued)

	Aviation Officer Candidate School (N=756)		Aviation Preflight Indoctrination: USNA (N=103)		Aviation Preflight Indoctrination: Other (N=138)		Aviation Preflight Indoctrination: Total (N=242)	
SELF-RATINGS ON SELECTED ACADEMIC COMPETENCIES (Percent Above Average)								
Note taking skills	280	(37.2%)	27	(26.5%)	53	(38.4%)	80	(33.2%)
Mathematical computations	365	(48.6%)	54	(52.4%)	63	(45.7%)	117	(48.3%)
Writing papers	290	(38.6%)	38	(36.9%)	55	(39.9%)	93	(38.4%)
Memorizing facts	293	(39.0%)	42	(41.2%)	56	(40.6%)	99	(41.1%)
Performance on timed tests	307	(40.9%)	34	(33.3%)	52	(38.0%)	87	(36.2%)
ANTICIPATED TRAINING DIFFICULTIES (Most Difficult)								
Physical demands	142	(19.3%)	10	(10.4%)	21	(16.0%)	31	(13.7%)
Academic subjects	154	(21.0%)	22	(22.9%)	44	(33.6%)	66	(29.1%)
Military discipline	172	(23.4%)	1	(1.0%)	3	(2.3%)	4	(1.8%)
Psychological stress	111	(15.1%)	12	(12.5%)	5	(3.8%)	17	(7.5%)
Cockpit performance	33	(4.5%)	22	(22.9%)	21	(16.0%)	43	(18.9%)
Swimming requirements	96	(13.1%)	24	(25.0%)	27	(20.6%)	51	(22.5%)
Other	27	(3.7%)	5	(5.2%)	10	(7.6%)	15	(6.6%)
COLLEGE SIZE								
Less than 1000 students	29	(3.9%)	--	--	4	(2.9%)	4	(1.7%)
1001-2500 students	89	(11.9%)	--	--	27	(29.7%)	34	(14.1%)
2501-5000 students	96	(12.8%)	103	(100.0%)	14	(10.2%)	109	(45.2%)
5001-10000 students	120	(16.0%)	--	--	25	(18.2%)	26	(10.8%)
10001-20000 students	179	(23.8%)	--	--	26	(19.0%)	27	(11.2%)
20001-30000 students	124	(16.5%)	--	--	22	(16.1%)	22	(9.1%)
Over 30000 students	114	(15.2%)	--	--	19	(13.9%)	19	(7.9%)
COLLEGE SELECTIVITY								
Low selectivity	220	(35.8%)	--	--	20	(18.3%)	20	(9.4%)
Medium selectivity	207	(33.7%)	--	--	58	(53.2%)	58	(27.4%)
High selectivity	153	(24.9%)	103	(100.0%)	29	(26.6%)	132	(62.3%)
Very high selectivity	34	(5.5%)	--	--	2	(1.8%)	2	(.9%)
Median College SAT Score	970		1228		1017			
COLLEGE REGION								
South	233	(35.8%)	103	(100.0%)	45	(40.2%)	148	(68.8%)
Non-South	417	(64.2%)	--	--	67	(59.8%)	67	(31.2%)

Table C5.3 Military/Aviation Profile of NASC Accessions (May-Sept 1986)

	Aviation Officer Candidate School (N=756)		Aviation Preflight Indoctrination USNA (N=103)		Aviation Preflight Indoctrination Other (N=138)		Total (N=242)	
MILITARY EXPOSURE								
Parent(s) in Navy	204	(27.0%)	38	(36.9%)	41	(29.7%)	79	(32.6%)
Relative(s) in Navy	326	(43.1%)	46	(44.7%)	61	(44.2%)	107	(44.2%)
Parent(s) in Military	344	(45.5%)	41	(39.8%)	64	(46.4%)	106	(43.8%)
Relative(s) in Military	422	(55.8%)	61	(59.2%)	90	(65.2%)	152	(62.8%)
INITIAL INTEREST IN MILITARY								
In high school or as a young child	374	(49.7%)	102	(100.0%)	110	(79.7%)	213	(88.4%)
In college or after graduation	378	(50.3%)	--	--	28	(20.3%)	28	(11.6%)
INITIAL INTEREST IN NAVY								
In high school or as a young child	172	(22.8%)	100	(97.1%)	94	(73.4%)	195	(84.1%)
In college or after graduation	581	(77.2%)	3	(2.9%)	34	(26.6%)	37	(15.9%)
INITIAL INTEREST IN AVIATION								
In high school or as a young child	441	(58.8%)	75	(72.8%)	83	(60.1%)	159	(65.7%)
In college or after graduation	309	(41.2%)	28	(27.2%)	55	(39.9%)	83	(34.3%)
AVIATION EXPOSURE								
(Percent family members who are:)								
Navy aviators	67	(9.3%)	14	(14.1%)	9	(7.0%)	23	(10.0%)
Air Force aviators	44	(6.2%)	7	(7.1%)	10	(7.8%)	17	(7.5%)
Army aviators .	23	(3.3%)	1	(1.0%)	3	(2.4%)	4	(1.8%)
Marine aviators	18	(2.6%)	1	(1.0%)	5	(3.9%)	6	(2.7%)
Coast Guard aviators	5	(.7%)	--	--	--	--	0	(0.0%)
Enlisted air crew members	28	(4.0%)	4	(4.1%)	11	(8.7%)	15	(6.7%)
Civil Air Patrol aviators	15	(2.1%)	--	--	1	(.8%)	1	(.4%)
Civilian aviators	136	(19.2%)	13	(13.0%)	15	(11.9%)	28	(12.3%)

Table C5.3 (continued)

	Aviation Officer Candidate School (N=756)		Aviation Preflight Indoctrination USNA (N=103)		Aviation Preflight Indoctrination Other (N=138)		Total (N=242)	
INFLUENCES ON AVIATION INTERESTS								
(Informal Influences)								
Relative in military aviation	253	(34.0%)	35	(34.3%)	47	(34.3%)	82	(34.2%)
Relative in commercial aviation	118	(15.9%)	10	(9.8%)	7	(5.2%)	17	(7.1%)
Friend in militatary aviation	351	(46.8%)	41	(40.6%)	81	(59.1%)	123	(51.5%)
Friend in commercial aviation	209	(28.0%)	9	(8.8%)	35	(25.7%)	44	(18.4%)
Friend in ROTC	197	(26.5%)	2	(2.0%)	64	(46.7%)	66	(17.5%)
(Formal Influences)								
Navy recruiter	508	(68.0%)	9	(8.8%)	25	(18.5%)	36	(14.3%)
Media advertisements	481	(64.4%)	39	(38.3%)	78	(57.4%)	117	(49.0%)
Blue and Gold Team	126	(17.0%)	27	(26.5%)	25	(18.3%)	52	(21.8%)
Blue Angels	457	(61.2%)	79	(77.5%)	80	(58.8%)	159	(66.5%)
PERCENT WITH PREVIOUS FLYING EXPERIENCE	308	(40.7%)	34	(33.0%)	44	(32.1%)	78	(32.4%)
PERCENT WITH PRIVATE PILOTS LICENSE	106	(34.4%)	4	(11.8%)	7	(15.9%)	11	(14.1%)
MEDIAN FLIGHT HOURS	40.00		16.00		15.00		16.00	
MEAN FLIGHT HOURS	127.68 (S.D.=239.77)		35.12 (S.D.=41.44)		122.30 (S.D.=516.62)		87.71 (S.D.=402.23)	
AVIATION PROGRAM (Anticipated)								
Student Naval Pilot	596	(79.7%)	71	(68.9%)	91	(65.9%)	163	(67.4%)
Student Naval Flight Officer	131	(17.5%)	32	(31.1%)	46	(33.3%)	78	(32.2%)
Aviation Intelligence	15	(2.0%)	--	--	1	(.7%)	1	(.4%)
Aviation Maintenance	6	(.8%)	--	--	--	--	--	--

Table C5.4 Profile of NASC Accessions Extracurricular and Leisure/Fitness Activities (May - September, 1986)

	Aviation Officer Candidate School (N=756)		Aviation Preflight Indoctrination USNA (N=103)		Other (N=138)		Total (N=242)	
COLLEGIATE EXTRACURRICULAR ACTIVITIES								
Band	57	(7.8%)	12	(12.0%)	18	(14.5%)	30	(13.4%)
Drama	50	(6.9%)	4	(4.0%)	8	(6.5%)	12	(5.4%)
Greek Org.	219	(30.2%)	--	--	37	(29.6%)	37	(16.6%)
Team Sports	227	(31.1%)	49	(49.0%)	44	(33.3%)	94	(40.3%)
Individual Sports	151	(21.2%)	26	(26.8%)	25	(20.3%)	51	(23.2%)
Intramural Sports	592	(80.9%)	92	(92.0%)	118	(89.4%)	210	(90.5%)
Political Org.	103	(14.3%)	2	(2.0%)	18	(14.5%)	21	(9.4%)
Service Org.	202	(27.8%)	26	(26.5%)	51	(39.5%)	77	(33.9%)
Student Govt.	113	(15.7%)	10	(10.3%)	14	(11.1%)	25	(11.2%)
Honors Org.	145	(20.1%)	10	(10.2%)	23	(18.3%)	34	(15.1%)
Professional Org.	320	(44.0%)	22	(22.4%)	51	(40.8%)	74	(33.0%)
Yearbook	38	(5.3%)	2	(2.0%)	4	(3.3%)	6	(2.7%)
MEAN NUMBER OF EXTRACURRICULAR ACTIVITIES	Mean = 2.97 S.D. = 1.81		Mean = 2.50 S.D. = 1.30		Mean = 3.00 S.D. = 1.65		Mean = 2.78 S.D. = 1.52	
PHYSICAL FITNESS AND LESIURE ACTIVITIES								
Swimming	535	(70.8%)	70	(68.0%)	76	(55.1%)	146	(60.3%)
Bowling	117	(15.5%)	17	(16.5%)	11	(8.0%)	28	(11.6%)
Weightlifting	402	(53.2%)	54	(52.4%)	56	(40.6%)	111	(45.9%)
Volleyball	181	(23.9%)	12	(11.7%)	26	(18.8%)	38	(15.7%)
Baseball/Softball	295	(39.0%)	25	(24.3%)	31	(22.5%)	56	(23.1%)
Basketball	275	(36.4%)	39	(37.9%)	50	(36.2%)	89	(36.8%)
Football/Rugby	162	(21.4%)	20	(19.4%)	25	(18.1%)	45	(18.6%)
Running	651	(86.1%)	88	(85.4%)	118	(85.5%)	207	(85.5%)
Exercises (e.g. aerobics)	174	(23.0%)	27	(26.2%)	32	(23.2%)	59	(24.4%)
Track and Field	231	(30.6%)	23	(23.3%)	39	(28.3%)	63	(26.0%)
Boating	231	(30.6%)	23	(23.3%)	39	(28.3%)	63	(26.0%)
Golf	274	(36.2%)	45	(43.7%)	43	(31.2%)	88	(36.4%)
Bicycling	298	(39.4%)	25	(24.3%)	41	(29.7%)	66	(27.3%)
Tennis/Racquetball	349	(46.2%)	42	(40.8%)	54	(39.1%)	96	(39.7%)
Calisthenics	134	(17.7%)	21	(20.4%)	37	(26.8%)	59	(24.4%)
Skiing	354	(46.8%)	29	(28.2%)	44	(31.9%)	73	(30.2%)
Soccer	94	(12.4%)	11	(10.7%)	17	(12.3%)	28	(11.6%)
Gymnastics	16	(2.1%)	--	--	--	--	--	--
Hockey	52	(6.9%)	1	(1.0%)	3	(2.2%)	4	(1.7%)
Archery	38	(5.0%)	1	(1.0%)	5	(3.6%)	6	(2.5%)
Pool	153	(20.2%)	20	(19.4%)	30	(21.2%)	50	(20.7%)
Table Tennis	105	(13.9%)	10	(9.7%)	11	(8.0%)	21	(8.7%)
MEAN NUMBER OF FITNESS/ LEISURE ACTIVITIES	Mean = 6.52 S.D. = 3.19		Mean = 5.73 S.D. = 2.69		Mean = 5.46 S.D. = 2.87		Mean = 5.57 S.D. = 2.79	
SWIMMING ABILITY (self-rated)								
Above average	335	(44.5%)	41	(39.8%)	62	(44.9%)	104	(43.0%)
About average	383	(50.9%)	48	(46.6%)	71	(51.4%)	119	(49.2%)
Below average	35	(4.6%)	14	(13.6%)	5	(3.6%)	19	(7.9%)
RUNNING ABILITY (estimated distance)								
Number of Miles	Mean = 7.71 S.D. = 4.67		Mean = 10.32 S.D. = 8.52		Mean = 10.31 S.D. = 7.09		Mean = 10.32 S.D. = 7.72	

Table C5.5

Comparisons of Minority and Non-Minority NASC Accessions on Selected Background Characteristics

<u>Naval Aviation Schools Command</u>

<u>SELECTED BACKGROUND CHARACTERISTICS</u>	<u>Asians</u> (<u>N=20</u>)	<u>Blacks</u> (<u>N=18</u>)	<u>Hispanics</u> (<u>N=38</u>)	<u>Whites</u> (<u>N=904</u>)
AGE				
Mean	23.74	25.11	23.91	23.68
S.D.	1.73	2.70	1.63	1.75
COLLEGE GRADES				
Mean	2.69	2.72	2.79	2.84
S.D.	.43	.35	.38	.40
COLLEGE MAJOR (Percent Technical)	60%	72%	55%	49%
PRE-FLIGHT EXPERIENCE				
Entered With Experience	25%	31%	34%	39%
Private Pilots License	29%	25%	29%	25%
Median Flight Hours	40	50	22.5	27
SWIMMING				
Percent Expecting Major Training Difficulties	20%	37%	16%	15%
Percent Below Average On Self-Rated Ability	0%	25%	9%	8%

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